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Plant Breeding Abstracts

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FILE

STATISTICS

2129 GEIDEL, H.
Zur abgekürzten Berechnung des Schätzwertes des Standardfehlers von Beobachtungsreihen für $n \leqq 3$. (**The rapid calculation of the estimated value of the standard error of series of observations where $n \leqslant 3$**).
Z. Acker- u. PflBau. 1958 : **106** : 470–74.

Further to earlier articles on approximate methods for determining statistics [XXVII, 6–7],* a method of calculating the sums of deviations without determining the mean values for $n \leqslant 3$ is described.

2130 WERMKE, M.
Zur Frage der Streuversuche. (**Questions concerning dispersed trials**).
Z. landw. Vers.- UntersuchWes. 1958 : **4** : 50–64.

Six barley varieties were tested in trials with dispersed and compact layouts; six replications were involved in each trial, both trials being carried out on the same field. Analyses of variance showed that the standard deviation was greater with the dispersed layout than with the compact one. Other trials of oats and barley were also carried out, the replications being scattered over wider areas in the dispersed layouts; the more widely separate the replications the greater became the standard deviation. Soil conditions were shown to have an important influence on varietal performance. The value of the results of a dispersed trial increases with the number of replications involved; even 22 experimental plots in different places did not provide sufficient information concerning the suitability of a variety to a particular area.

2131 ELANDT, R.
O możliwościach stosowania testów nieparametrycznych w zagadnieniach doświadczalnictwa rolniczego. (**The possibility of applying nonparametric tests to problems of agricultural experimentation**).
Roczn. Nauk rol. : Ser. A : 1957 : **75** : 161–87.

Nonparametric tests which may be applied in experiments conducted over many years, to multiple experiments, to single-replica experiments and to breeding trials are outlined. In testing for homogeneity of two populations the sign test is used; for independence, the tendency test or the rank correlation test; and for goodness of fit, Kolmogorov's λ test.

2132 SVÁB, J.
Kísérletsorozat értékelése variancia-analízissel, teljes bontásban; a kölcsönhatás értelmezése. (**The evaluation of a series of trials by means of variance analysis with complete partitioning; interpretation of the interaction**).
Növénytermelés 1958 : **7** : 121–42.

A method for the analysis of a series of experiments is presented. The technique involves partitioning the variation effects into single components, and squaring is not carried out until the table of variance analysis is to be compiled; subsequently, significance is tested in the normal way. The method may be used for the combined analysis of a series of experiments in which each experiment is laid out in a randomized-block design with the same treatments and the same number of replications; such experiments include those which (*a*) last several years, with one trial per year, (*b*) are conducted for one year at different localities, (*c*) involve perennial plants, with observations extended over several years, and (*d*) involve crops giving several cuts per year. The interpretation of interaction effects is discussed.

2133 WIJNHOVEN, J.
Statistische methoden en het ontwerpen van experimenten. (**Statistical methods and experimental design**).
Agricultura, Louvain 1958 : **6** : 585–94.

The importance of planning experiments is discussed and a brief survey of experimental designs based on analysis of variance is presented, reference being made to the uses of completely randomized designs, Latin squares, Grecolatin squares and incomplete block designs.

2134 OKUNO, T.
(**The design and analysis of field experiments. II. Split plots**).
Nogyo Gijutsu Kenkyusho Hokoku/Bull. Nat. Inst. agric. Sci. : Ser. A. : 1958 : No. 6 : 81–146. [Japanese].

In a previous paper [XXV, 1528], mathematical models and likelihood ratio tests were

* References in square brackets are to volume and number of entry in *Plant Breeding Abstracts*.

developed for completely randomized and randomized-block designs and intrablock analysis of incomplete block designs was considered. In the present paper, interblock analysis of split-plot designs is investigated for the case where the whole-plot and sub-plot errors correspond respectively to the interblock and intrablock errors. Analysis of variance and likelihood-ratio tests are described. A parallel treatment of split-block designs follows.

2135 GRAYBILL, F. A. & KNEEBONE, W. R.
Determining minimum populations for initial evaluation of breeding material.
Agron. J. 1959 : **51** : 4–6.

With special reference to forage crops, two statistical procedures are illustrated.

"The first method, is derived from known or estimated coefficients of variation and, by use of the graph presented, enables the experimenter to determine minimum sample sizes necessary so that the *average lengths* of confidence intervals in any series of evaluations will be a stated percentage of the parameter mean with stated confidence probability.

"The second method, by a two step sampling technique enables the experimenter to determine the sample size necessary to obtain sample means which will be within *stated limits* from the true mean in a predetermined percentage of the evaluations."

2136 PEARCE, S. C.
Problemas específicos de delineamento e de técnica experimental em culturas perenes. (**Specific problems of design and experimental technique in perennial crops**).
Agros, Rio Grande do Sul 1956 : **9** : No. 2 : 12–21.

[Cf. XXVII, 1001].

GENETICS

Abstracts of papers read at the hundred and twenty-eighth meeting of the Genetical Society of Great Britain, held on 14th and 15th November 1958, at University College, London.
Heredity 1959 : **13** : 141–44.

2137 *Bevan, E. A. Genetic change in diploid yeast.* (*pp. 141–42*).

Using red coloration as a genetic marker, the frequency of spontaneous change from heterozygosity to homozygosity was studied in diploid cells of *Saccharomyces cereviseae* at the Botany School, Oxford. White diploid cells "of constitution α ad_1 (red) *me tr* $+/a$ + (white) + + *ur*" were plated out; of the resulting colonies, up to 42% were sectored red and about 0·05% were pure red. It was found that all single-cell isolates from these colonies were diploid. Analyses of single cell isolates from the red and white parts of 50 sectored colonies revealed the presence of two homozygous methionine-requiring strains and two uracil-requiring strains among the white cells; among the red cells, one requiring uracil and one requiring methionine were found.

Among 2117 colonies derived from haploid cells which had been treated with ultraviolet radiation, only one isolate was found to have mutated at the $+/ad_1$ locus. Also nine auxotrophs requiring methionine, six requiring tryptophane and two requiring uracil were found; these have not yet been tested for allelism.

In view of these contrasting results it is suggested "that a mechanism other than what may be termed 'classical' gene mutation is responsible for the high frequency of change at specific loci in heterozygous diploid cells".

2138 *Rowlands, D. G. Self-fertility in the field bean* (Vicia faba *L.*). (*p. 142*).

Natural cross pollination in commercial crops was found to vary between 20 and 70%, an average of 30% being most common under normal conditions. However, few seeds are set in the absence of insects and artificial tripping rarely gives a complete seed set. The spontaneous self fertility, without tripping, of a population shows a continuous distribution, when measured by the total number of seeds produced per plant.

The results of a diallel cross using six parent plants indicated that certain plants crossed more successfully than others but crossing did not appear to be consistently superior to selfing. In an insect-proof greenhouse, considerable differences in spontaneous self fertility were found amongst the progeny. In general, crosses were more self fertile than selfs and some parents had progeny which were more self fertile than others. A covariance/variance graph indicated considerable interaction ($b = 0{\cdot}32 \pm 0{\cdot}13$); this interaction disappeared when one parental array was removed.

A system of incompatibility largely based on polygenes is postulated; it is supposed that this system developed from a more efficient system as the result of selection for uniformity.

2139 *Reissig, J. L. Forward and back mutation at the* pyr$_3$ *locus of* Neurospora. (*p. 144*).
Mutation of *pyr*$_3^+$ to *pyr*$_3$ suppresses the citrulline requirement of mutant 33442 (*cit*). Strains of the genotype *cit pyr*$_3^+$ require only citrulline, whilst *cit pyr*$_3$ strains require only pyrimidine for growth.
In order to select for forward mutants at the *pyr*$_3$ locus, a *cit pyr*$_3^+$ microconidial strain was plated on a minimum medium supplemented with hydrolysed RNA (plus lysine and canavanine to eliminate leakage). Of 19 colonies tested after ultraviolet radiation resulting in 85% killing, 11 could grow on a minimum medium; this was presumably due to back mutation at the *cit* locus. The other colonies were pyrimidine dependent as a result of forward mutation at the *pyr*$_3$ locus. These colonies were tested for their ability to complement each other in heterocaryons and two complementary groups, each consisting of four mutants, were found. No recombinants were obtained in 5·8 x 10^4 ascospores from intergroup crosses.
A *cit pyr*$_3$ strain was plated on a minimum medium plus arginine or citrulline. After ultraviolet radiation with 75% killing, about half the surviving colonies were citrulline dependent; presumably back mutations had occurred at *pyr*$_3$. The other colonies could grow on a minimum medium; in one case a mutation at an unlinked suppressor locus had occurred.

2140 Lewis, D.
The experimental approach to life.
University College, London 1957 : Pp. 17.
In this inaugural lecture the speaker gave a broad survey of the chief discoveries which have been essential to the development of modern genetics and discussed the significance of the increasing role played by the chemical and physical approaches in genetics and other branches of biology.

Proceedings of the Genetics Society of Canada 1958 : 3 : No. 1 : Pp. 83.

2141 *Fryer, J. R. Second Huskins Memorial Lecture.* (*pp. 6–13*).
This lecture begins with a brief account of the life and work of C. L. Huskins.
A brief discussion is also presented of some of the areas of contact between genetics and biochemistry. The topics considered are the relations between genetics and nucleic acids, enzymes and viruses, cytoplasmic inheritance and the genetics and biochemistry of flower pigments.

2142 *Unrau, J. & McGinnis, R. C. Genetic studies on cereals in Canada.* (*pp. 14–24*).
A survey is presented of some of the important work on cereal genetics done in Canada, an indication being given of the state of current research. Studies of interspecific and intergeneric hybrids, the inheritance of disease reaction, solid stem and quantitative characters, spontaneous and induced mutations, the phylogeny of wheat and polyploids are mentioned.

2143 *Person, C. Development of concepts in rust genetics.* (*pp. 25–29*).
Craigie, who worked out the relations between the monocaryotic and dicaryotic stages of rusts, set the stage for a study of rust genetics; much activity in this field followed his discoveries. Physiological variation was investigated and the concepts of differential hosts and physiological races were introduced.
This essay is primarily concerned with investigations on the genetics of pathogenicity; in particular the work of Johnson and Newton is discussed. These workers showed that the segregating unit of pathogenicity is revealed by its interaction with an individual variety; the physiological race represents the total of the pathogenicity reactions of several loci taken as a group. Thus they showed that segregations for pathogenicity can be interpreted independently of the differential host and physiological race concepts.
How the genetic systems of host and parasite interact is not yet known. Flor has suggested that for each locus conditioning rust reaction in the host there is a specific locus conditioning virulence and avirulence in the parasite. Although Flor's conclusions have been criticized by Mayo, it is thought that his methods of investigation and concepts will play an important role in future interpretations of the interactions between hosts and parasites. This problem is considered to be ultimately a physiological one; it is important to investigate the metabolic systems involved in host : parasite interactions.
Another unsolved problem is the mechanism of origin of new physiological races. There is some evidence that new rust genotypes can result from mixed infections.

2144 *Armstrong, J. M. & Greenshields, J. E. R. Cytogenetics of forage crops.* (*pp. 30–34*).
Work published by Canadian scientists on the cytogenetics of forage legumes and grasses and other forage crops is briefly mentioned.

2145 *Hunter, A. W. S. & Sampson, D. R. Genetic studies with horticultural plants in Canada.* (*pp. 35–40*).

In this survey, the work of Canadian geneticists on tomato, broccoli, cucumber, onion, pea, broad bean, radish, apple and stone and soft fruits is outlined; some radiation studies are also mentioned.

2146 *Heimburger, C. Forest tree breeding and genetics in Canada.* (*pp. 41–49*).

Forest tree breeding in Canada is primarily concerned with providing the best possible material for artificial forest regeneration. Much of the work mentioned in this survey has been reported elsewhere in *Plant Breeding Abstracts.* In British Columbia, *Pinus monticola, Pseudotsuga menziesii* and *Thuja plicata* are being selected for resistance to *Cronartium ribicola, Rhabdocline pseudotsugae* and *Didymascella thujina* respectively. Also studies on flowering and fertility in Douglas fir and hybridization experiments with this species are in progress.

In Saskatchewan attention is being paid to the breeding of trees and shrubs suitable for shelterbelts and windbreaks; *Caragana*, spruce, Scotch pine and poplars are being used. Compatibility relationships in *Caragana* have also been studied. Seedlings of Colorado spruce, *Picea pungens*, with blue needle coloration have shown immunity to *Phenacaspis pinifoliae*; self incompatibilities and cross incompatibilities have been found within this species. Breeding of *Picea glauca* and *Pinus sylvestris* is also under way. *Populus deltoides* and *P. nigra-laurifolia* hybrids are being evaluated for the rooting ability of stem cuttings and general adaptation to prairie conditions.

At Petawawa, Ont., the work is mainly concerned with spruce and hard pines; geographic and climatic racial differentiation of natural populations is being studied. Several natural hybrids between *Picea mariana* and *P. rubens* have been found and interspecific hybrids involving various spruces have been produced. Selections of Scotch pine superior in respect of Christmas-tree characters have been made and a collection of plus Christmas-tree clones established. Another project is breeding for resistance to *Rhyacionia buoliana* in hard pines.

A search for superior stands and individual trees of spruce and *Abies balsamea* has been started in New Brunswick. Some balsam firs apparently resistant to *Archips fumiferana* have been selected. The numbers of cotyledons in seedlings of balsam fir and spruce are higher in southern provenance-types than in northern types. Also the cone measurements and 1000-seed weights of red spruce, *Picea rubens*, are highest in the southern types. Crosses were made between exotic species of *Abies* and native balsam fir.

At Maple, Ont., work with white pine, aspen poplars and hard pines is under way. In respect of white pine, the aim is to select and produce strains having a high degree of resistance to blister rust, *Cronartium ribicola*, and weevil injury and satisfactory growth rate and form. The low stratification requirement of seeds of *Pinus griffithii* was found to be partially dominant in crosses with other species. Seedlings of *P. monticola* and *P. parviflora* grow rather poorly on their own roots but hybrids with *P. strobus* do not have this trouble. The slow growth of *P. peuce* tends to dominate in hybrids with other species. Dominance relationships of other morphological characters have also been determined. Particular attention has been paid to the genetical control of resistance to blister rust and weevil attack in *Pinus* species; compatibility studies have also been carried out.

Hybridization of various aspen species with one another and with *Populus albus* is being used to produce strains which are adapted to southern Ontario, easily propagated by stem cuttings, resistant to disease and fast growing. Breeding of early-flowering stocks is also under way; this character appears to be polygenically controlled and partially dominant.

At Toronto University, the photoperiodic response of aspens, poplars, pine and spruce is being studied.

The results of investigations on the Dutch elm disease indicated that *Ulmus americana* and *U. pumila* have no true resistance to *Ophiostoma* (*Ceratocystis*) *ulmi*, only tolerance. Attempts are being made to produce X-ray mutants resistant to the disease.

Cytogenetic and photoperiodic studies of *Caragana* are in progress in Ottawa.

2147 *Löve, A. & Beaudry, J. R. Plant cytotaxonomy in Canada.* (*pp. 50–56*).

Some past achievements and current research of scientists working in Canada on this subject are mentioned.

SMITH, D. E. (Editor)
Proceedings of the International Congress of Radiation Research, Burlington, Vermont, USA, August 11-15, 1958.
Radiation Res. 1959 : Suppl. 1 : xvi + 577.

Symposium A: General progress and status of radiation research. (*pp. 1–124*).

2148 *Ehrenberg, L. Radiobiological mechanisms of genetic effects. A review of some current lines of research.* (*pp. 102–23*).

This review is concerned with radiation-induced changes in nuclear material; changes in cytoplasmic systems of inheritance are not considered. The topics discussed include: the dependence of radiation-induced mutations on the dose; questions related to target and gene size; the influence of ion density; substructure of the gene; specificity of mutagenic agents; back mutations; sensitive stage for the induction of mutation; modifying factors and radiomimetic effects of oxygen.

Symposium D: Attempted analysis and correlation of various radiobiological actions on the same kind of cell (yeast). (*pp. 326–94*).

2149 *Magni, G. E. Genetic effects of radiation on yeast cells and genetic control of radiosensitivity.* (*pp. 347–56*).

An attempt is made to analyse the present state of knowledge on these topics. Work on recessive and dominant lethals is discussed and it is pointed out that both types of lethals are induced in both haploid and polyploid cells. The recessive lethals are more efficient in killing haploid cells and dominant effects are more efficient in polyploids. Experiments are described indicating that cytoplasmic lethal damage is probably induced by ionizing radiations, especially at high dosages; the possibility of nongenetic damage has to be taken into account when studying the genetic lethal effect of radiation. Evidence for the occurrence of recessive lethals in the heterozygous condition, the effect of heterozygosis on radiosensitivity and the genes affecting radiosensitivity during meiosis are also discussed. The author has obtained results indicating that during both mitotic and meiotic cell division the resistance to radiation varies. In many diploid strains of *Saccharomyces cerevisiae*, there is a sudden increase in radiation resistance between the sixteenth and twentieth hours after the transference of vegetative cells to sporulation media and there is a subsequent decrease at about the end of meiosis. Strain 157d showed, in addition to the increase in radiation resistance, a sudden change in the shape of X-ray survival curves. Genetic analysis revealed that this strain was heterozygous for a gene designated *Rs* showing incomplete dominance. The genotype *rs/rs* gave sigmoidal inactivation curves throughout the whole meiotic process; *Rs/Rs* gave constantly exponential inactivation and the genotype *Rs/rs* showed either one or the other of the two types of reaction.

2150 *James, A. P. Invited discussion.* (*pp. 391–93*).

It is pointed out that mutation provides a refined technique for altering the internal environment of the cell, such alterations being useful in analysing radiobiological effects. Certain physiological processes in yeast may possibly be disrupted both by the mutation of a controlling gene and the interference of ionizing radiation acting on the process itself. A variant of yeast is known which shows delayed lethality similar to that of an irradiated diploid cell.

The apparently orthodox behaviour of yeast in regard to its genetic mechanisms is emphasized. Recent experiments with an inbred line indicated the frequent occurrence of unequal crossing-over. An irregular segregation pattern of 1 : 2 : 1 arose sporadically, two of the segregants being normal and two variant; one of the variants grows extremely fast and the other very slowly. Since the strain is highly inbred the simplest explanation appears to be that of unequal crossing-over occurring at meiosis. A more infrequent segregation pattern is that of 2 : 2 in which two of the segregants are plus variants and two are minus variants with respect to growth. This type of segregation has occurred consistently in the progeny of one irradiated cell; it is thought that unequal crossing-over again occurred, this time at mitosis.

2151 *Mortimer, R. K. Invited discussion.* (*pp. 394–402*).

The nature of radiation-induced damage in yeast and the modification of radiation damage by physicochemical and biological factors are discussed.

Symposium E: Induced changes in DNA and in chromosome structure. (*pp. 403–53*).

2152 *Butler, J. A. V. Changes induced in nucleic acids by ionizing radiations and chemicals.* (*pp. 403–16*).

An outline is provided of present knowledge of DNA and of nucleoproteins. The chemical and physical changes induced in these substances by ionizing radiations and nitrogen mustards and similar alkylating agents are discussed, reference being made to *in vitro* and *in vivo* reactions.

2153 *Wolff, S. Interpretation of induced chromosome breakage and rejoining.* (*pp. 453–62*).

Studies of X-irradiated *Tradescantia* microspores and seeds of *Vicia faba* and barley revealed that the number of cells possessing multiple exchanges is always smaller than that

expected from a random distribution of aberrations. It is believed that there are a limited number of sites within the nucleus where the two strands of the chromosomes come close enough to effect an exchange. It is believed that radiation usually causes breaks of covalent bonds in the chromosomes; the distance over which rejoining can occur is thought to be about 0·1 μ. Also the rate of rejoining of breaks is dependent on the dose but independent of the number of breaks. There may be a "rejoining system" that can be damaged by radiation. The rejoining of nonionic bonds depends on the production of ATP.

2154 NAKAZAWA, S.
Protoplasmic polarity as a groundwork for genic actions.
Protoplasma 1959 : **50** : 208–11.

Mainly with reference to work on *Rana* ova, *Equisetum* spores and eggs of brown algae, the author postulates that morphogenesis is a function of three variables: genic action, protoplasmic polarity and the environment. The specific action of each gene depends upon an oriented disuniformity in intracellular conditions, this protoplasmic polarity being in turn affected by the environment.

2155 CARR, A. J. H. & OLIVE, L. S.
Genetics of *Sordaria fimicola*. III. Cross-compatibility among self-fertile and self-sterile cultures.
Amer. J. Bot. 1959 : **46** : 81–91.

"Cross-compatibility in *Sordaria fimicola* is shown to be dependent upon a number of factors controlling the sexual process, from hyphal anastomosis and nuclear migration on through to perithecial formation and nuclear compatibility. Fertile cultures which were incompatible through inability to anastomose were induced to cross by the use of a third culture which would anastomose with both. Certain spontaneous or irradiation-produced sterility mutants were found to be compatible if the sterility genes were at different loci, through complementation by the wild-type alleles. In some pairings, cross-karyogamy was preferential, and in one case, only hybrid perithecia were produced. Fully fertile recombinants segregated from these crosses in frequencies which indicated that the sterility loci were unlinked. Certain sterility genes were found to influence hyphal anastomosis, nuclear migration, and the development of fertile sector heterokaryons from the zone of anastomosis. Mutant factors at two loci in a U.V. mutant causing self-sterility were found also to be responsible for lethality in ascospore germination. Factors in one sterility mutant controlled the production of a sterility-inducing substance which diffused into the medium. In some crosses, complementation of two sterile cultures towards fertility is shown to require a balanced nuclear ratio. Factors are described which increase the inhibitory effect of one sterility gene, while another factor was found to suppress its effect and thereby make the culture self-fertile. It is concluded that, since there is recombination between the sterility loci, these results do not represent the derivation of balanced heterothallism from a normally homothallic system, although it may lead by evolutionary progression to such a life cycle. The possible physiologic action of the sterility genes is discussed." [Authors' summary].

2156 DUBININ, N. P.
(The problem of the physical and chemical principles of heredity).
Biofizika (Biophysics) 1956 : **1** : No. 8 : 677–95. [from: Ref. Ž. [Ref. J.] 1958 : No. 4 : Abst. 14405 : p. 32]. [Russian].

This survey of genetical and cytogenetical research dealing with the physical and chemical properties of the chromosome and the structure and functions of DNA culminates in a discussion of the concepts of the chromosome and the gene. The author rejects the idea of the gene as "a special indivisible structural biological unit". Of the chromosome he says that it is so highly differentiated that the synthesis of proteins and other substances by its different portions proceeds in such a manner as to make it appear that a chromosome consists of separate structural components, the genes.

2157 HESIN, R. B.
(The role of deoxyribonucleic acids in the transformation processes of bacteria).
Uspehi Sovrem. Biol. (Advanc. in Mod. Biol.) 1958 : **46** : 114–29. [Russian].

A review of research, mostly published in English, dealing with interrelations between nucleic acids and heredity in microorganisms is presented.

2158 VAN ARKEL, G. A.
Enige aspecten van het genetisch onderzoek bij schimmels. **(Some aspects of genetical research in moulds).**
StudKring. PlantVeredel., Wageningen 1958 : 828–30. (Mimeographed).

In this short survey the application of fungal genetics to the following fields is touched on: studies of recombination; determination of

mutation frequency; analysis of biochemical reactions; and heterocaryosis and mitotic crossing over.

2159 Esser, K. & Straub, J.
Genetische Untersuchungen an *Sordaria macrospora* Auersw., Kompensation und Induktion bei genbedingten Entwicklungsdefekten. **(Genetical investigations in *S. macrospora* Auersw., compensation and induction in gene-determined defects of development).**
Z. VererbLehre 1958 : **89** : 729–46.

At the Botanical Institute of Cologne University, 23 mutant forms were isolated from X-irradiated material of the monecious, self-compatible species *S. macrospora.* Crosses with the wild form showed that 22 of these forms had a mutant gene and, in one case, a chromosomal aberration had occurred. Eighteen of the gene mutants were sterile, the development of the fruiting bodies being arrested at definite stages. Most of the mutant genes were also responsible for alterations in the form of the mycelium and the colour of the spores.

It was possible to effect crosses between sterile mutants in which the mutant genes were not alleles; heterocaryons were formed. In such crosses, mutual compensation of genetically determined defects occurred. Some crosses involving sterile mutants yielded completely fertile perithecia as a result of self fertilization, the asci containing spores of only the parental type. The mutant *ire,* in which the ascospores are arranged in a nonlinear manner, produced in crosses with other mutants *ire* spores which showed normal linear arrangement. Other crosses involving sterile mutants gave mixed fruiting bodies containing asci derived from both heterocaryotic and homocaryotic zygote nuclei. It is supposed that neighbouring nuclei of different genetic constitution in the heterocaryon exerted some compensatory action enabling normal development to proceed. No diffusible substances responsible for this effect could be isolated; it is suggested that the induction may be effected through the cytoplasm.

2160 Hadorn, E.
George W. Beadle.
Experientia 1958 : **14** : 467–68.

Notes are provided on the life and work of the above scientist who has recently been awarded a Nobel prize. A special mention is made of his genetical and biochemical studies of microorganisms.

2161 Wallenfels, K.
Edward L. Tatum.
Experientia 1958 : **14** : p. 468.

A brief account is presented of some of the contributions to biochemical genetics made by Tatum, a recent Nobel prize winner.

2162 Leupold, U.
Joshua Lederberg.
Experientia 1958 : **14** : p. 468.

The achievements of Lederberg in the field of bacterial genetics are outlined. For this work Lederberg was awarded a Nobel prize, shared with Beadle and Tatum.

2163 Pateman, J. A.
The effect of selection on ascospore size in *Neurospora crassa.*
Heredity 1959 : **13** : 1–21.

At the University of Sheffield, selection for increased ascospore size was carried out for 16 generations. The mean ascospore size increased from about 27 μ x 15 μ to about 31 μ x 18 μ. The eight-spored type of ascus became very rare and asci containing four large spores were produced by crosses between the selected strains; there was also a great increase in the frequency of aborted asci and ascospores. After about eight generations, the selection procedure became ineffective.

In crosses between wild-type strains and large-spored strains, the F_1 asci all contained eight normal ascospores, there being no unusual abortion. The wild-type genotype showed complete dominance.

Evidence was obtained indicating that ascospore size and the type of ascus development is largely under the control of a system of polygenes.

There were small but significant differences in the mean ascospore lengths of reciprocal crosses between large ascospore strains and wild types; in all cases the mean ascospore length of the F_1 was greatest when the wild-type strain was the maternal parent.

Possible explanations for these results and for the evolution of four-spored species from eight-spored species are suggested.

2164 Eberhart, B. M. & Tatum, E. L.
A gene modifying the thiamine-requirement of strains of *Neurospora crassa.*
J. gen. Microbiol. 1959 : **20** : 43–53.

"A new gene, *thi–1o,* is described in *Neurospora crassa.* This gene is shown to be a modifier of the nutritional response of strains containing the *thi–1* gene, and is not nutritionally detectable in the absence of *thi–1.* The gene *thi–1o* is additionally characterized by a decreased

ability to synthesize thiamine from thiazole and pyrimidine: *thi–1o* appears to modify only *thi–1* strains because of their unusually high thiamine requirements. The nutritional responses of strains containing either *thi–2* or *thi–3* are not affected by the presence of *thi–1o*. Both *thi–1o* and *thi–4* are anomalous in the condensation of pyrimidine and thiazole. The probability that *thi–1o* may be an isoallele of *thi–4* is based upon a similarity of metabolic pattern and upon location on chromosome III. The failure to obtain recombination in crosses between strains containing *thi–1o* and *thi–4* constitutes additional support for their allelism." [Authors' summary].

2165 Suskind, S. R. & Kurek, L. I.
On a mechanism of suppressor gene regulation of tryptophan synthetase activity in *Neurospora crassa*.
Proc. nat. Acad. Sci. USA 1959 : **45** : 193–96.

A detailed report is given of investigations providing evidence that suppressor-gene action in the *td* system for tryptophane requirement may be concerned with the expression of enzyme activity rather than with enzyme formation [cf. 1115].

2166 Goodman, F.
A study of the mechanism of resistance to ultraviolet light in a strain of *Neurospora crassa*.
Z. VererbLehre 1958 : **89** : 675–91.

A microconidial strain of *N. crassa* resistant to ultraviolet radiation was isolated at Columbia University, NY; resistance was found to behave as a recessive character in heterocaryons with macroconidial strains. From a study of the survival kinetics of the resistant strain, the parent microconidial strain, a macroconidial strain and the heterocaryons, it is concluded that inactivation of conidia may be the result of three independent processes. At low doses of irradiation, the nuclei are inactivated or recessive lethal mutations are induced; at higher doses, there is also cytoplasmic inactivation. "The development of resistance to ultraviolet irradiation may be attributed to an increase in average number of nuclei per conidium and a concomitant increase in cytoplasmic target number. The latter is directly proportional to the volume of the conidium." Using data found in the literature, the hypothesis of cytoplasmic inactivation was applied in the analysis of the inactivation kinetics of various other organisms.

2167 Ajzenštat, Ja. S.
(Some questions of segregation of hybrid plants).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) : Otdel biol. (Biol. Ser.) 1958 : **63** : No. 4 : 101–17. [Russian].

In reply to Ėfroimson [cf. XXVII, 2497], the writer reaffirms the findings of his experiments with tomato and pea hybrids which have given, depending on the mode of pollination, different segregation ratios from those that were theoretically to be expected. Evidence in support of these views is provided in tables showing the modes of segregation of some pea hybrids.

2168 Ėfroimson, V. P.
[Contrary to the obvious truth (on an article by Ja. S. Ajzenštat "Some questions of segregation of plant hybrids")].
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) : Otdel biol. (Biol. Ser.) 1958 : **63** : No. 5 : 133–40. [Russian].

A reexamination of some data published by A. Ja. Ajzenštat shows that in the majority of families the ratios conform either exactly or fairly closely to the expected Mendelian ratios. Reasons are adduced for believing that the exceptions are due to contamination with pollen from the seed parent or other plants than the pollen parent, resulting from faulty technique; if this were the case then there would be no departure from Mendelian ratios in these families either. Some of the effects of pollinating with aging pollen [cf. XXV, 1497] are also thought to be ascribable to out pollination. The general validity of the Mendelian laws is illustrated by reproducing some of the published data on segregation in a number of different plants and animals.

2169 Gans, M. & Prud'homme, N.
Échanges nucléaires chez le Basidiomycète *Coprinus fimetarius* (Fr.).
[Nuclear exchanges in the basidiomycete *C. fimetarius* (Fr.)].
CR Acad. Sci., Paris 1958 : **247** : 1895–97.

When a fragment of the dicaryotic mycelium sor^s A_1B_1 *on* k + sor^s A_2B_2 on^+k^+ was grown on the periphery of the monocaryotic colony sor^r A_2B_1 on^+k^+, in which the single nucleus is incompatible with both those of the dicaryon, two dicaryotic clumps were found in the monocaryotic colony. One was of the constitution sor^r A_2B_1 on^+k^+ + sor^s A_1B_2 on^+k^+, in which the new nuclear type could have arisen through

either mutation or chromosome recombination. In the other the new nuclear type appeared to be *sor*^{s} A_1B_2 *on*$^{+}$*k*, which is more easily explained as a result of recombination than as one of mutation.

2170 Prud'homme, N. & Gans, M.
Formation de noyaux partiellement diploïdes au cours du phénomène de Buller. (Formation of partially diploid nuclei during the course of the Buller phenomenon).
CR Acad. Sci., Paris 1958 : **247** : 2419–21.

Studies of segregation in the progenies obtained in experiments of the type referred to in the preceding abstract indicate that the chromosomal recombinations detected result from the formation of partially diploid nuclei in the initial dicaryotic material.

2171 Wallace, M. E.
An experimental test of the hypothesis of affinity.
Genetica 1959 : **29** : 243–55.

Experimental evidence for the phenomenon of affinity in the mouse is presented [cf. XXIV, 11 and XXVIII, 1129 and 3658].

2172 Lee, B. T. O. & Pateman, J. A.
Linkage of polygenes controlling size of ascospore in *Neurospora crassa*.
Nature, Lond. 1959 : **183** : 698–99.

Evidence has been obtained that a part of the polygenic system determining ascospore size is linked with locus *al*–2 for albinism [cf. XXVI, 2023 and XXIX, 2163].

2173 Forbes, E.
Use of mitotic segregation for assigning genes to linkage groups in *Aspergillus nidulans*.
Heredity 1959 : **13** : 67–80.

"1. A technique based on mitotic segregation has been devised for quickly and easily assigning new mutants to their linkage groups in *Aspergillus nidulans*.

"2. The technique is based on the fact that strains of *A. nidulans* with diploid nuclei produce haploids vegetatively as a rare but regular event. As the process of mitotic haploidisation is known not to be associated with mitotic crossing over, the individual members of each chromosome pair segregate as whole units. Thus, among such haploids, markers on different chromosome pairs show free recombination, while markers on any one chromosome pair do not recombine.

"3. Heterozygous diploids are prepared between a suitable strain carrying the new mutant and two tester strains, marking between them seven of the eight chromosome pairs. Haploid segregants are selected automatically by a number of devices which distinguish them from those segregants, still diploid, which arise by mitotic crossing over.

"4. Seven new markers on five chromosome pairs have been located by this technique. Subsequent meiotic analysis has confirmed each of these locations." [Author's summary].

2174 Wilson, J. Y.
Chiasma frequency in relation to temperature.
Genetica 1959 : **29** : 290–303.

An examination of the literature on the above topic revealed that the results reported are of the following five types: (*a*) the relationship between temperature and cross over frequency is in the form of a bimodal or U-shaped curve; (*b*) chiasma frequency is reduced at low and high temperatures but not at intermediate temperatures; (*c*) there appears to be a positive correlation between temperature and cross-over or chiasma frequency; (*d*) the relationship appears to be negative; and (*e*) temperature has either no effect on chiasma frequency or there is a certain temperature at which chiasma frequency reaches its lowest value.

It is concluded that this diversity of results cannot be attributed to differences in the genotypic or physiological constitution of the experimental material. There appear to be two main sources of error. One of these is that very different periods of time have been used for these experiments and there is evidence that cross-over or chiasma frequency changes with time in material kept at a constant temperature. As a remedy it is suggested that the experimental material should be given just enough time for a complete cycle of meiosis at each of the temperatures being used in the investigation; preliminary experiments would be necessary in order to determine the length of time required at each temperature. The second source of error is variation between individuals of the same experiinental material with respect to mean cross-over or chiasma frequency. It is suggested that clonal material should be used, for this would be homogeneous in cross-over frequency. Using the method of approach indicated, legitimate comparisons could be made between the effects of temperature on the cross-over frequency of different organisms. Experiments on field clones of *Endymion nonscriptus* revealed a gradual but consistent decrease of chiasma frequency with increasing temperature in the pollen mother cells.

2175 Levine, R. P. & Ebersold, W. T.
The relation of calcium and magnesium to crossing over in *Chlamydomonas reinhardi*.
Z. VererbLehre 1958 : **89** : 631–35.

An attempt was made to repeat and extend experiments carried out by Eversole and Tatum [cf. XXVI, 2982]. The results obtained were not in agreement with those of Eversole and Tatum. There was no evidence that either treating the gametes with a chelating agent or growing the cells in a medium deficient in calcium causes any significant alteration in the frequency of crossing over between the loci *arg*–1 and *arg*–2 in *C. reinhardi*.

2176 Alihanjan, S. I. & Mindlin, S. Z.
(Hybridization of Actinomycetes).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) Ser. Biol. 1958 : No. 4 : 416–21. [Russian].

Joint culture of biochemically deficient variants of *Streptomyces rimosus* gave rise to new prototrophic forms differing from the initial organisms in morphological characteristics and antibiotic activity. Several types arose from each set of components, most being heritably stable, though some gave 3–5% biochemically defrcient segregates similar to one strain of the initial culture. The experiments suggest that recombinations occur in *S. rimosus*.

2177 Gorjunov, D. V.
(A conference on interspecific and intergeneric hybridization between plants and between animals).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) Ser. Biol. 1958 : No. 4 : 502–07. [Russian].

An extended account of a report previously summarized is given [cf. 61].

2178 Piza, S. de Toledo (Jun.)
Os gens trabalham diferentemente nas diferentes partes do organismo. **(The genes act differently in different parts of the organism).**
Rev. Agric., Piracicaba 1958 : **33** : 129–32.

The notion that gene action is mainly localized in particular parts of the organism is criticized and the view that the chromosome as a whole is the basic genetic unit is reaffirmed.

2179 Piza, S. de Toledo (Jun.)
A morte do gen. I. O gen não é uma molécula viva. **(The death of the gene. I. The gene is not a living molecule).**
Rev. Agric., Piracicaba 1958 : **33** : 187–91.

The statement that the gene is a living molecule is criticized as involving a confusion of logical categories. Life is regarded as a functioning system and therefore cannot be predicated of an isolated chemical unit.

2180 Spicer, C. C. & Datta, N.
Reversion of transduced antigenic characters in *Salmonella typhimurium*.
J. gen. Microbiol. 1959 : **20** : 136–43.

"A strain of *Salmonella typhimurium*, in which the H antigens had been altered by transduction with a bacteriophage lysate of *S. abony* to the form $b \longleftrightarrow enx$ has been found to revert in the first or second phases giving rise to organisms with the structure $i \longleftrightarrow enx$ and $b \longleftrightarrow 1{\cdot}2$. No reversions in both phases have so far been detected. This phenomenon has been observed only in non-lysogenic strains; lysogenic varieties have remained stable."
[Authors' summary].

2181 Woese, C.
Radiation destruction of the plaque-forming ability of spores of lysogenic *Bacillus megaterium*.
Radiation Res. 1959 : **10** : 370–79.

"The destruction by X-rays of the plaque-forming ability of three phages and spores of *Bacillus megaterium* strains lysogenic for these phages is studied. It is found that the phages inactivate in a 'single-target' fashion, whereas the spores inactivate in a 'two-target' fashion as a function of X-ray dose. There is in every case a constant ratio between radiation size of the free phage and radiation size of the corresponding plaque-forming ability of the lysogenic spore.
"These results are interpreted to mean (1) that the plaque forming ability of the spore is destroyed by destroying the prophage, (2) that there are two prophages per spore, and (3) that for noninducible lysogenic strains the prophage is not an addition to already existing bacterial genetic material, but results from the replacement of existing bacterial genetic by (or its transformation into) phage genetic material."
[Author's summary].

2182 Campbell, A.
Transduction and segregation in *Escherichia coli* K12.
Virology 1957 : **4** : 366–84.

"The transduction of the gal$^+$ character into gal$^-$ mutants of *Escherichia coli* K12 with high frequency transducing (HFT) lysates of phage λ has been studied. Sensitive recipients infected at low multiplicity give rise to heterogenotes carrying a defective prophage. Simultaneous

infection with a nontransducing phage increases the probability of transduction and causes the cell to become lysogenic. Lysogenic recipients upon transduction generally remain lysogenic for the original prophage. Prophage substitution and double lysogenization rarely occur. Loss of the gal$^+$ character from the defective lysogenics is generally accompanied by loss of the defective prophage. Loss of the gal$^+$ character from the double lysogenics is correlated with changes in prophage content."

[Author's summary].

2183 Kaiser, A. D. & Jacob, F.
Recombination between related temperate bacteriophages and the genetic control of immunity and prophage localization.
Virology 1957 : **4** : 509–21.

"Lysogenic bacteria are immune to infection with phage homologous to the prophage. By means of crosses between phages showing different immunity specificities it is shown that immunity specificity is determined by the same segment of the phage genetic material that controls the ability of the phage to lysogenize. Furthermore, this same segment, called the 'c_1 region', also determines which locus is occupied by the prophage on the chromosome of *Escherichia coli* K12."

[Authors' summary].

2184 Rosenberg, B. H., Sirotnak, F. M. & Cavalieri, L. F.
On the size of genetic determinants in pneumococcus and the nature of the variables involved in transformation.
Proc. nat. Acad. Sci. USA 1959 : **45** : 144–56.

"The activity of a sample of DNA depends on its ability to be absorbed on the surface of the bacterium, absorbed through the membrane, and incorporated into the genome, as well as on the number of markers which it contains. An equation has been derived which relates the rate of distinction of markers to their size, and this, combined with the kinetic equation for transformation, gives the transforming activity as a function of marker size. The latter can be evaluated by cleaving the DNA molecules and following the loss in activity, but first it is necessary to determine the molecular weight dependence of the adsorption (binding) constant, of the absorption rate constant, and of the probability of incorporation into the genome. "Simultaneous absorption and transformation measurements have been carried out [on *Diplococcus pneumoniae*] with quadruply marked DNA degraded by mechanical shear. Information and conclusions bearing on the above variables and on the pneumococcal surface have been presented and are discussed quantitatively in terms of the equations developed for transformation, absorption and marker destruction.

"The salient points are: (1) a large part, although not necessarily all, of the observed loss in transforming activity can be attributed to decreased absorption of DNA; (2) the size of the genetic marker is small, possibly of the order of several nucleotides; (3) there are probably two types of absorption site on the pneumococcal surface, one of which absorbs only DNA of molecular weight greater than about $2{\cdot}2 \times 10^6$; (4) a constant number of mols rather than a constant weight of DNA is probably bound by each type of site at saturation; (5) the molar binding constant for DNA by bacterial sites is constant in the range studied below $M_n = 2{\cdot}2 \times 10^6$; (6) the probability of incorporation of each marker into the bacterial genome has a different dependence on molecular weight.

"Results obtained with other methods of degrading DNA are discussed in terms of the variable mentioned above and the applicability of target theory. It is concluded that the physical interpretation of such results is far more complex than has hitherto been realized."

[Authors' summary].

2185 Lindegren, C. C.
Priority in gene-conversion.
Experientia 1958 : **14** : 444–45.

Gene conversion is said to comprise the interaction by genes in the heterozygous state resulting in a change from dominant to recessive or *vice versa*. It is pointed out that Winkler first introduced the hypothesis of gene conversion in 1930; Renner in 1937 and Lindegren and Mundker in 1949 published work confirming the hypothesis. Since 1955 a number of other workers have found phenomena which are "operationally indistinguishable" from Winkler's gene-conversion; these authors have coined different names for the phenomenon. The refutations of gene conversion by Beadle, Winge, Emerson and Roman are rebutted.

2186 Serra, J. A.
A position-effect explanation of gene conversion.
Nature, Lond. 1959 : **183** : p. 700.

After concisely surveying reported cases of gene

conversion and the various theories put forward to explain them, the author suggests that stable conversion within a complex locus may be interpreted on the basis of intragenic crossing-over which, by separating subloci, restores the intragenic position effect responsible for the mutant phenotype.

2187 SCHECROUN, J.
Sur la nature de la différence cytoplasmique entre souches *s* et s^s de *Podospora anserina*. (**On the nature of the cytoplasmic difference between strains *s* and s^s of *P. anserina***).
CR Acad. Sci., Paris 1959 : **248** : 1394–97.
The hypothesis of the particulate nature of the cytoplasmic factor *s* [cf. XXVIII, 3673] receives support from the observation that in the progeny of ♀*s* x ♂*S*, the elimination of the factor is not complete, occasional spores with *s* being found.

2188 DAY, P. R.
A cytoplasmically controlled abnormality of the tetrads of *Coprinus lagopus*.
Heredity 1959 : **13** : 81–87.
Fruit bodies with pale gills bearing tetrads with from two to six basidiospores were obtained from one cross between two wild-type monocaryon stocks, normal fruit bodies being obtained from the reciprocal cross.
There is some evidence that the abnormality is determined by the cytoplasm and it may be a result of aging. Normal and abnormal dicaryons were resolved into their component parts and used as cytoplasm parents in further crosses; in most cases the type of fruit body produced resembled that of the parent dicaryon. Meiotic irregularities were found in the abnormal fruit bodies.

2189 MARCOU, D. & SCHECROUN, J.
La sénescence chez *Podospora* pourrait être due à des particules cytoplasmiques infectantes. (**Senescence in *Podospora* could be due to infective cytoplasmic particles**).
CR Acad. Sci., Paris 1959 : **248** : 280–83.
Experiments on culturing hyphae from mycelia developed from the anastomosis of two genetically marked strains of *P. anserina*, one senescent and the other normal, suggested that senescence was due to cytoplasmic particles which could infect and travel along the normal hyphae.

2190 BENNETT, J. H.
The existence and stability of selectively balanced polymorphism at a sex-linked locus.
Aust. J. biol. Sci. 1958 : **11** : 598–602.
An amplified account is given of a problem discussed earlier [XXVIII, 1145]. The selective values obtained by Wallace in a study of the effect of selection on the sex ratio in *Drosophila pseudoobscura* are shown to differ considerably from those expected from the author's formulae.

2191 MORAN, P. A. P. & WATTERSON, G. A.
The genetic effects of family structure in natural populations.
Aust. J. biol. Sci. 1959 : **12** : 1–15.
The rate of homozygotization of a finite interbreeding diecious diploid population is derived for the case of nonoverlapping generations. The rate is unchanged if random mating is replaced by monogamy. A general solution for models involving overlapping generations has not been found though one particular model was shown to behave the same as the equivalent nonoverlapping model. However, it was shown that in other cases, the nature of the generations does affect the asymptotic behaviour.

2192 VAN DER VEEN, J. H.
The 2 x 2 genotype-environment table.
Heredity 1959 : **13** : 123–31.
Given that d stands for the average genotypic effect, e, the average environmental effect and g, the genotype-environment interaction, it is possible to represent the relative magnitudes of the phenotypic values of 2 genotypes G_0 and G_1 in 2 environments E_0 and E_1 as

	G_0	G_1
E_0	$d + e + g$	e
E_1	d	g

Then, taking d and e as nonnegative, if $d > |g|$ and $d > e$, we have unconditional superiority of G_0. When $e > |g|$ and $e > d$, then E_0 shows unconditional superiority. When $|g| > d$ and $|g| > e$, unconditional superiority of either of the genotypes or either of the environments is lacking and we have specific adaptation.

2193 NEI, M. & SYAKUDO [SHAKUDO], K.
The estimation of outcrossing in natural populations.
Idengaku Zasshi/Jap. J. Genet. 1958 : **33** : 46–51.
The degree of outcrossing is defined as the proportion of ovules fertilized by the pollen of foreign individuals irrespective of their genotype.

A maximum likelihood method of estimating this value for a population with a character showing simple Mendelian inheritance is described and exemplified with reference to data on chromosome frequencies in *Trillium kamtschaticum* obtained by Narise [XXVII, 1087].

2194 Yura, T.
Genetic alteration of pyrroline-5-carboxylate reductase in *Neurospora crassa*.
Proc. nat. Acad. Sci. USA 1959 : **45** : 197–204.

Evidence has been obtained suggesting that the pyrroline-5-carboxylate reductase of *N. crassa* undergoes a structural alteration, possibly at the catalytic site, as the result of a mutation at locus *prol*–1. The alteration has the consequences of a three- to four-fold increase in activation energy of the reaction and a marked decrease in thermostability of the enzyme. In addition, heat inactivation of the altered enzyme showed a higher degree of dependence on temperature than the wild-type enzyme. Several other properties of the enzyme were however essentially unchanged. The alteration was accompanied by a marked decrease in specific reductase activity. It is suggested that a qualitative change may be a fairly frequent consequence of single-gene mutations in which the activity of a specific enzyme is known to be very low or apparently lacking. [Cf. 1147].

2195 Woodward, D. O., Partridge, C. W. H. & Giles, N. H.
Complementation of the *ad-4* locus in *Neurospora crassa*.
Proc. nat. Acad. Sci. USA 1958 : **44** : 1237–44.

"One hundred and twenty-three mutants at the *ad–4* locus have been tested for complementation in heterocaryons. Fifty-one of the mutants gave at least one positive response. Although these mutants lack adenylosuccinase activity, partial enzyme activity is restored when complementing mutants are combined in heterocaryons. The relationships of the complementing mutants at the *ad–4* locus are such that these mutants can be arranged in a unique sequence which may be designated a complementation map of this locus. This arrangement is possible because of the apparent presence in certain alleles of continuous multiple non-functional regions which overlap non-functional regions of other alleles. The complementation map of the *ad–4* locus is divided into seven functional regions (cistrons). There is a marked correlation between distance on the complementation map and the strength of the heterocaryon as judged by enzyme activity, growth rate, or time required for growth to commence from mixed conidial inocula. Thus heterocaryons between mutants damaged in adjacent cistrons have low adenylosuccinase activities, and activities increase with increasing distance to the maximum value of 25 per cent. of wild type for mutants separated by 2–5 cistrons.

"Possible interpretations of these results are discussed and the hypothesis is proposed that interallelic complementation involves the formation of defective gene products by different mutant nuclei in a heterocaryon. Cytoplasmic recombination of such gene products either at the primary (RNA) or secondary (polypeptide) level, perhaps by a process analogous to crossing over, could yield enzymatically active protein."
[Authors' summary].

2196 Howell, E. V. & Nicholes, P. S.
Antagonism between parent and mutant populations in *Escherichia coli*.
Proc. Utah Acad. Sci. 1957 : **34** : 164–65.

A citrate-utilizing mutant was inhibited by a specific substance produced by its parent when both strains were grown in the same liquid medium. Colonies from resistant cells always appeared in the zone of inhibition. Their progenies were resistant to the inhibitor and were themselves able to produce the substance.

2197 Lubin, M.
Selection of auxotrophic bacterial mutants by tritium-labeled thymidine.
Science 1959 : **129** : 838–39.

Thymidine-H^3 has been found to be an efficient selective agent for the isolation of auxotrophic mutants of *Escherichia coli*. Use of thymidine-H^3 will be particularly valuable in the case of bacterial species to which the penicillin method is not applicable on account of their insensitivity to this antibiotic.

2198 Lester, H. E. & Gross, S. R.
Efficient method for selection of auxotrophic mutants of *Neurospora*.
Science 1959 : **129** : p. 572.

The rapid loss of viability of the conidia of an inositol-requiring mutant, when germinated in a medium devoid of inositol, may be considerably reduced if an additional growth-factor requirement is imposed by synthesizing double mutants through appropriate crosses. For example, an *inos tryp*–3 double mutant, requiring both inositol and tryptophane, has a

rate of conidial inactivation 70-fold less than that of the original *inos* strain. The inhibition of death due to lack of inositol by superimposition of an additional growth factor requirement suggested that induced auxotrophic mutants in an *inos* background would be at a selective advantage under conditions of inositol deprivation. Details are given of a selection technique which takes advantage of this situation.

2199 Whitfield, J. F. & Baird, K. M.
Nucleic acid synthesis by a lysogenic strain of *Escherichia coli* infected with an rII mutant of coliphage T2.
Canad. J. Microbiol. 1959 : **5** : 17–24.

Mutants of the group rII are known to lack the ability of the parent phage T2 to form plaques on strains of *Escherichia coli* lysogenic for phage λ. Observations on $T2r_7$, a mutant belonging to this group, indicated that the infecting phage can initiate but cannot maintain DNA synthesis in the host cell.

2200 Kaudewitz, F.
Mutationen bei Bakterien. (**Mutations in bacteria**).
Naturwissenschaften 1958 : **45** : 529–32.

The topics dealt with in this general survey include mechanisms by which mutant forms are selected, induction of mutations and delayed expression of mutation.

2201 Okada, T.
(The mechanism of formation of chewed up sectored colonies).
Idengaku Zasshi/Jap. J. Genet. 1958 : **33** : 176–87. [Japanese].

Demerec and Fano [XV, 925] reported the appearance of so-called chewed up sectors and thin colonies when *Escherichia coli* 'B' and T3 phage are plated out. The experiments described here demonstrate that these colonial types result from interaction between B/3 bacteria and T3h mutants.

2202 Okada, T.
(On irregular plaques on *Escherichia coli* B produced by a variant of T3 phage).
Idengaku Zasshi/Jap. J. Genet. 1958 : **33** : 188–91. [Japanese].

Irregular plaques were produced when T3hs phage derived from *E. coli* 'Bs/3' was plated out with *E. coli* 'B'; normal round plaques resulted when the same phage strain was plated out with *E. coli* 'Bs/3'.

2203 Dai, K.
(The mechanism of irregular plaque formation by T3 phage).
Idengaku Zasshi/Jap. J. Genet. 1958 : **33** : 216–27. [Japanese].

Experiments are reported in support of the view that the irregular plaques produced by T3hs phage on *Escherichia coli* 'B' [cf. 2202] are due to back mutation from the minute state T3hm to $T3hm^+$. It is supposed that this back mutation occurs with high frequency on *E. coli* 'B' but not on *E. coli* 'Bs/3'.

2204 Okada, T. & Dai, K.
(Character changes accompanying mutation to resistance to T3 phage).
Idengaku Zasshi/Jap. J. Genet. 1958 : **33** : 228–37. [Japanese].

Further to the studies published on irregular plaque formation on *Escherichia coli* 'B' by phage strain T3hs, it is shown that this phage strain produces irregular plaques on bacterial strains resistant to phages other than T3 and T4.

2205 Raper, J. R., San Antonio, J. P. & Miles, P. G.
The expression of mutations in common-A heterokaryons of *Schizophyllum commune*.
Z. VererbLehre 1958 : **89** : 540–58.

In heterocaryons of *Schizophyllum commune* resulting from matings of strains possessing common factors at the locus *A* for incompatibility, mutants of a few specific types have been found to occur regularly. This phenomenon is termed heterocaryotic mutagenesis and the mutant products het mutants [cf. XXIII, 965 and XXIV, 2716]. The het mutants appear as radially organized atypical growths ranging from large sprawling mycelia to small dense clumps; the frequency of expressed het mutants varies between 10^{-9} and 3×10^{-5}. Each type with the exception of dwarf differs from the wild type by a single mutated locus; each mutant allele is recessive to its wild-type counterpart in the balanced dicaryon.
Of all the external factors tested, only temperature was found to have a significant effect upon the expression of the mutants; the rate of expression is much lower at 15·5° C. than at 24° and 34°. As the age of the heterocaryons increases they tend to produce more of the

extreme types of mutant and fewer of the less aberrant forms.
Mutant expression in heterocaryons of varying genetic background was compared. Specific combinations of strains show high het-mutant expression but this is not conferred by any individual strain. In some cases, the het-mutant expression in paired, reciprocally constituted heterocaryons is markedly different. Mutants induced by ultraviolet irradiation of homocaryons show a wider range of variability than the het mutants. Possible mechanisms for the origin of het mutants are discussed.

2206 Langridge, J.
An osmotic mutant of *Arabidopsis thaliana*.
Aust. J. biol. Sci. 1958 : **11** : 457–70.
A single recessive mutation, induced by X irradiation, caused distorted growth, narrower leaves, reduction in the number of secondary roots and complete sterility when the plants were grown on a minimum agar medium at 23° C. [cf. XXVIII, 3690]. At 18° C. the mutant plants were very small and soon died, but at 28° C. development was normal. The aberrant phenotype was the consequence of an abnormally low cellular osmotic pressure, since at 23° C. addition of glucose, sucrose or potassium sulphate in amounts resulting in an osmotic pressure of the substrate greater than 2·5 atm. restored normal growth. Phenocopies induced by depressing the effective osmotic pressure of normal plants by growth on minimum agar + mannitol closely resembled mutant plants in most respects. Like the mutation, mannitol brought about a decrease in both cell number and size. Addition of glucose or potassium sulphate to the minimum medium caused an increase in leaf width in the mutant. Glucose had the effect of increasing cell division only, while the effect of potassium sulphate consisted mainly of increasing cell size. An incompatibility system was a secondary consequence of the mutation. Pollen from mutants failed to develop on the stigmas of mutants but effected fertilization when applied to wild-type stigmas. The reciprocal pollination failed. Fertility was restored in the mutant by raising the osmotic pressure of the substrate, the relationship between osmotic pressure of the medium and number of seeds set per plant being linear. No differences could be detected between mutant and wild-type plants in carbohydrate metabolism or cell permeability; the cause of the low osmotic pressure of the mutant remains unknown.

2207 Angulo Carpio, M. D.
Acción de agentes físicos en citogenética. (Notas bibliográficas). [**Action of physical agents in cytogenetics. (Bibliographical notes)**].
Genet. iber. 1958 : **10** : 209–26.
A further supplement to previous lists is presented [cf. XXVIII, 3740].

2208 Lefort, M. & Marcovich, H.
Quelques aspects physicochimiques des effets génétiques des radiations ionisantes. (**Some physicochemical aspects of the genetic effects of ionizing radiations**).
Ann. Génét. 1958 : **1** : No. 1 : G.18–G.24.
The absorption by matter of the energy of ionizing radiations is briefly described. The effect may be direct or indirect according to whether or not the molecule which initially absorbed the radiation is also the molecule which undergoes modification, for it is known that energy may be handed on from one molecule to another. When living cells are irradiated, the energy is first absorbed by the water present and is then transmitted to organic molecules. The water molecules react with the radiations to give electrons and H_2O^+ ions which subsequently interact to give hydroxyl radicals and hydrogen atoms; these then react readily with organic compounds. Some examples of the chemical effects brought about by these radicals are described. Oxygen when present combines with hydrogen atoms and organic radicals to give peroxides and thereby causes increased sensitivity to radiation. The action of ionizing radiation on nucleic acids involves rupture of the P–O bonds of the internucleosidic phosphoester groups, this effect being brought about by the free radicals. It is pointed out that the radiochemical effects mentioned take place in a very short period of time and therefore chemicals having a protective action against the effects of irradiation on biological systems are only effective if applied before the irradiation and similarly anoxia is not effective unless it occurs during the period of irradiation.

2209 Fritz-Niggli, H.
Mögliche Ursachen der verschiedenen Strahlenempfindlichkeit des Erbmaterials in Keimzellen unterschiedlichen Alters. (**Possible causes of the different susceptibility to radiation of the hereditary material in germ cells of different age**).
Naturwissenschaften 1958 : **45** : 557–64.
This discussion is mainly concerned with the

results obtained from experiments with *Drosophila*. The rate of radiation-induced mutation varies with the age of the germ cells. Various factors such as oxygen, cold and intracellular respiratory poisons promote the induction of mutations, whilst nitrogen has a protective action. It is suggested that the sensitivity to radiation of the genetic material is dependent on the intracellular oxygen content. The amount of available oxygen varies according to the physiological condition of the germ cell, so causing variation in sensitivity to radiation.

2210 Angulo Carpio, M. D.
Acción de agentes químicos en citogenética. (Notas bibliográficas). [**Action of chemical agents in cytogenetics. (Bibliographical notes)**].
Genet. iber. 1957 : **9** : 309–28; 1958 : **10** : 193–207.
Bibliographies are presented, arranged under the headings: alkaloids; chemical substances other than alkaloids; specifically mutagenic agents; and other active substances.

2211 Iyer, V. N. & Szybalski, W.
Mutagenic effect of azaserine in relation to azaserine resistance in *Escherichia coli*.
Science 1959 : **129** : 839–40.
The above antibiotic induced mutation from streptomycin dependence to independence in azaserine-resistant strains only at concentrations much above those required for the same mutation in the sensitive parental strain. When treated at barely bactericidal concentrations, the resistant strains gave however a mutagenic response many times higher than that of the sensitive parent under comparable conditions.

2212 Glass, E. A. & Novick, A.
Induction of mutation in chloramphenicol-inhibited bacteria.
J. Bact. 1959 : **77** : 10–16.
Mutations were induced by caffeine in *Escherichia coli* cells treated with chloramphenicol, which suppresses the synthesis of protein but not that of nucleic acid. The number of mutations per unit of DNA formed was similar to that of the uninhibited control cultures. The addition of adenosine suppressed the mutagenic action of caffeine. It is concluded that the DNA formed in chloramphenicol-inhibited bacteria is genetically functional and that DNA synthesis alone, rather than protein synthesis alone or some combination of protein and DNA synthesis, is necessary for the occurrence of mutations.

2213 Gustafsson, Å. & Ehrenberg, L.
Ethylene imine: a new tool for plant breeders.
New Scientist, Lond. 1959 : **5** : 624–25.
A popular account is given of the possible value of induced mutations in crop breeding, with particular reference to cereals and ethyleneimine. This substance has induced many more viable mutants in barley than X rays and other types of radiation.

2214 Mundry, K. W. & Gierer, A.
Die Erzeugung von Mutationen des Tabakmosaikvirus durch chemische Behandlung seiner Nucleinsäure *in vitro*. (**The production of mutations of the tobacco mosaic virus through chemical treatment of its nucleic acid *in vitro***).
Z. VererbLehre 1958 : **89** : 614–30.
[Cf. 1206].

2215 Kaudewitz, F.
Linear transfer of a potentially mutant state in bacteria.
Nature, Lond. 1959 : **183** : 871–73.
A detailed account is given of investigations which have already been briefly reported [1020].

2216 Gluscsenko [Gluščenko], I. E.
A vegetatív hibridizáció kérdésének jelenlegi helyzete. (**The present position of the question of vegetative hybridization**).
Magyar tud. Akad. Agrártud. Oszt. Közl. 1957 : **13** : 1–21.
Mičurinist theories are outlined and supported by references to the literature. The author concludes that: the hereditary characters of somatic cells may be changed by changes in nutrition; acquired characters are heritable; and varieties may be improved by means of vegetative hybridization.

2217 Cabezas de Herrera Sánchez, E.
Infección de diferentes géneros de leguminosas con una estirpe de *Rhizobium* procedente de *Vicia sativa* I. (**Infection of different Leguminous genera with a strain of *Rhizobium* from *V. sativa***).
An. Edafol. Fisiol. veg. 1958 : **17** : 387–96.
A *Rhizobium* strain isolated from *Vicia sativa* was able to cause nodules on only three out of nine leguminous species tested, but after repeated culture on an artificial medium, it gave rise to nodules on all but one of the species tested.

2218 Svinarev, V. I.
(The question of mutual relationships between plants in different systems of planting).
Bot. Ž. (Bot. J.), Moskva 1958 : **43** : 1434–44. [Russian].
Experiments are described in which cabbage plants were grown singly and in groups on the system of square planting. The root system of the former was regular whereas the plants growing in groups had asymmetrical root systems owing to a negative tropism between the roots of different individuals. Nevertheless, several cases of root fusion were observed, which indicates that such fusion is not a proof of the absence of competition.
The plants growing singly formed heads 8–12 days earlier and in the groups with several plants head formation occurred at different times in different plants. The size of the head was 1·5–2 times larger in the plants grown singly and although the total yield of green matter might be greater in the groups, the weight of marketable produce was invariably less. The yields from commercial square plantings in the Astrahan' collectives in 1954 were all lower than from plots planted singly.
The yields from group planting were less reduced when the root systems were separated by placing the plants in pots.
The significance of the results in proving the existence of intraspecific as well as interspecific competition is pointed out.

2219 Obolensky, G.
Current Soviet biology and world science.
Qual. Plant. Mater. veg. 1958 : **5** : 158–66.
The basis of the controversy between neo-Mendelism and Mičurinism is explained, reference being made to relevant experiments.

2220 Barker, J. S. F.
Simulation of genetic systems by automatic digital computers. III. Selection between alleles at an autosomal locus.
Aust. J. biol. Sci. 1958 : **11** : 603–12.
Applying the technique devised by Fraser [XXVIII, 1141–2], the effect of selection (either zygotic, reproductive, between gametes at meiosis, or between gametes at fertilization) on a pair of autosomal alleles was simulated using an electronic digital computer. Good agreement was obtained between the machine runs and the data obtained by Dobzhansky and Pavlovsky on competition between the ST and CH chromosome arrangements in large populations of *Drosophila pseudoobscura*. Less close agreement was obtained with the results reported by Merrell and Underhill on competition between mutant and wild alleles in small populations of *D. melanogaster*, the values produced by the machine runs all changing more slowly at first than the biological material.

2221 Barker, J. S. F.
Simulation of genetic systems by automatic digital computers. IV. Selection between alleles at a sex-linked locus.
Aust. J. biol. Sci. 1958 : **11** : 613–25.
In continuation of the experiments reported in the preceding abstract, computer runs simulating the effects of selection on a sex-linked locus were made. Wide divergence was obtained in attempting to simulate the results obtained by Wallace on the effect of selection on the sex ratio in large populations of *Drosophila pseudoobscura*, using Wallace's estimates of fitness. However, Wallace's results could be simulated if different fitnesses were used. Satisfactory simulation was obtained of the results obtained by Merrell and Underhill for the effect of selection on the sex-linked yellow mutant in small populations of *D. melanogaster*. This agreement confirms the hypothesis that selective mating is a major determinant of gene frequency in this case.

2222 Haldane, J. B. S.
The theory of natural selection to-day.
Nature, Lond. 1959 : **183** : 710–13.
The substance is given of the presidential address delivered at the congress held in Singapore during December 1958 to celebrate "the centenary of the formulation of the theory of evolution by Charles Darwin and Alfred Russel Wallace and the bicentenary of the publication of the tenth edition of the Systema Naturae by Linnaeus". The address consists mainly of an evaluation of the Linnaean species concept and the beliefs of Darwin and Wallace concerning the role of natural selection in evolution from the standpoint of modern biology. Possible future advances are also considered. Emphasis is laid on the stimuli gained by Linnaeus, Darwin and Wallace through working in "scientifically peripheral" areas where lack of knowledge was a challenge. It is suggested that the next major biological advance may well come for similar reasons from peripheral areas where this challenge still remains and where lack of complex scientific

apparatus often compels biologists to undertake research in different and long-neglected fields. Some of the research projects now being carried out by colleagues of the speaker at the Indian Statistical Institute, Calcutta, are briefly described. They include a study by K. Dronamraju of heterostyly in *Bauhinia acuminata*, in which both long-styled and short-styled flowers have been found on the same tree. Heterostyly may therefore have originated as a variation between flowers on a single plant, genes for heterostyly evolving at a later stage.

EVOLUTION

2223 Purchon, R. D.
Darwin, Wallace and Linnaeus celebrations in Singapore.
Nature, Lond. 1959 : **183** : 723–25.
An account is given of the above celebrations at a congress held during 1958 [cf. 2222]. The contributions to the various sections covered a wide range of biological subjects.

2224 Eiseley, L. C.
Charles Darwin, Edward Blyth, and the theory of natural selection. Appendix A. Selected articles written by Edward Blyth, published in *The Magazine of Natural History*, 1835-37. Appendix B. Memoir of Edward Blyth by Arthur Grote, published in the Journal of the Asiatic Society of Bengal, August, 1875.
Proc. Amer. phil. Soc. 1959 : **103** : 94–158.
The author gives documentary evidence on the basis of which he argues that Darwin made unacknowledged use of ideas expressed by Blyth in papers published in *The Magazine of Natural History* during 1835–37.

2225 Flew, A. G. N.
The structure of Darwinism.
New Biol. 1959 : No. 28 : 25–44.
Darwin's mode of presenting his evidence and theories is analysed according to logical principles, his capacity for a sound deductive approach being emphasized. Some of the wider philosophical implications of his work are also discussed.

2226 Heslop Harrison, J.
The origin of isolation.
New Biol. 1959 : No. 28 : 65–91.
Dealing with both plants and animals, the author reviews the principal features of reproductive isolation, referring to ecological, seasonal and temporal factors, restriction of mating, failure of fertilization, and hybrid inviability and sterility. He then discusses the origin and evolutionary significance of reproductive isolation.

2227 Muller, H. J.
Man's future birthright. An address at the University of New Hampshire, November 21, 1957 : Pp. 24.
The evolution of living matter is traced from a primeval nucleotide, by a combination of mutation and selection, to the higher organisms, including man, attention being called to the increasing problems of population pressure and of the risk of deleterious mutations arising from radioactive waste products or chemical agencies.

2228 Schmalhausen [Šmal'gauzen], I. I.
(Control and regulation in evolution).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) : Otdel biol. (Biol. Ser.) 1958 : **63** : No. 5 : 93–121. [Russian].
Analogies are drawn between an information system and various self-regulating biological systems. The regulating factor in evolution is provided by natural selection, and by the interrelationship between the individuals of any given population and their organic and inorganic environment, which permits of the transmission of information in both directions—from the population to the environment and *vice versa*, the former at the molecular level (DNA), the latter at the level of the individual; information codified in the form of genes is gradually decoded in the course of development, which is regulated by the impact of the environment. The constitution of a heterogeneous population changes constantly through natural selection, again under the impact of the environment. This operates through a change in the proportions of individuals of different constitution and through a change in the individuals themselves, resulting from segregation, mutation, duplication, polyploidy and other chromosomal changes. Although mutations may in certain cases be the direct result of chemical or other stimuli, the degree to which they are adaptive will only be determined by the effect of natural selection; acquired characters as such die with the individual and cannot be directly inherited. Cases in which a change in the genotype is identical with the corresponding phenotypical change are exceptional. A changed capacity for adaptive reaction may arise by mutation and this may then be incorporated into the hereditary constitution by natural

selection, two forms of which are envisaged, motive and stabilizing.

CYTOLOGY

2229 Julien, J. B.
A pinchcock as an aid in flattening chromosome preparations.
Stain Tech. 1959 : **34** : 47–48.

A modification of the spring type of pinchcock was found to provide a suitable means of applying uniform pressure to mounted preparations of *Venturia inaequalis*. It is thought that this clamp will be useful in dealing with other material in which the cell walls cannot be satisfactorily softened.

2230 Moreau, F.
Revue de cytologie. Les progrès récents de la cytologie des champignons en microscopie usuelle et en microscopie corpusculaire. (**A review of cytology. Recent progress in the cytology of fungi in ordinary microscopy and in microscopy involving elementary particles**).
Bull. Soc. bot. Fr. 1958 : **105** : 363–429.

This detailed review deals with techniques used in cytological investigations of fungi and brief accounts are provided of the results of some recent work, including research on Plasmodiophoraceae and yeasts.

2231 Pandey, K. K. & Henry, R. D.
Use of pectinase in pollen tube and pollen mother cell smears.
Stain Tech. 1959 : **34** : 19–22.

In studying pollen tube growth in self-fertile *Physalis pruinosa* and self-sterile *Ph. ixocarpa*, a cytological technique was developed which promises to be useful for pollen-tube studies in general. The styles were fixed in a modification of Carnoy's fixative (absolute alcohol, chloroform, acetic acid; 3 : 2 : 1), 48 hr. after pollination; the fixing lasted for 24 hr. The styles were then kept in a 5% aqueous pectinase solution (pH 4) on a spot plate for 24 hr. and afterwards stained in a mixture of 15 parts of 1% aqueous light green to 1 part Darlington and La Cour's acid fuchsin - light green stain. Staining lasted for 24 hr., the styles then being mounted individually in glycerol; the weight of the cover slip was usually sufficient to flatten the style. After this treatment, unstained pollen tubes were easily discernible throughout their lengths against a background of purplish blue stylar tissue. When fresh or fixed anthers were left in the pectinase solution for about an hour and then macerated in acetocarmine, almost all the pollen mother cells were separated from one another. The PMCs were also flattened by the weight of the cover slip without extra pressure being applied; this procedure is said to facilitate the separation of the chromosomes.

2232 Konarev, V. G.
(**Age-conditioned changes of the nucleus and the state of deoxyribonucleic acid**).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) Ser. Biol. 1958 : No. 4 : 395–402. [Russian].

In young cells, the affinity of the nucleus for methylene green was found to increase during development until cell differentiation began; thereafter the affinity for methylene green decreased whilst that for acid green increased and the nucleus also began to take up pyronin. Similar changes were caused by starvation and treatment with acids, salt solutions, high temperature and ultraviolet irradiation. The changes were associated with an alteration in DNA structure involving depolymerization, partial degradation of nucleotides and weakening of the bonds between the DNA and protein molecules.

2233 DeLamater, E. D.
A cytological and chemical analysis of the bacterial nucleus. 1. A method for the isolation of nuclei from *Bacillus megaterium* and the cytology of the isolated structures.
Exp. Cell Res. 1959 : **16** : 636–47.

Sodium glycocholate has a clearing action on cells of *B. megaterium*, leaving the nuclei visible and intact *in situ*. The bile salt also makes the cells more fragile and amenable to rupture by sonic vibration or mechanical disruption using the Mickle disintegrator, thus permitting liberation and isolation of the nuclei and chromosomes. The material obtained in this way has been studied by ordinary cytological procedures and phase contrast microscopy. The bacterial nucleus appears to be a complex structure containing chromosomes, granules suggesting centrioles and a spindle-like element. Also there was some indication of a mitotic cycle.

2234 Kinoshita, S. & Itagaki, S.
Studies on the nucleus of the spore in *Streptomyces*. Part I. Observations on the nuclear substance of the spore in *Streptomyces* which belong to A group.
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1958 : **71** : 335–42.

From one to four nuclei have been observed in the spores of *Streptomyces* species of the A group.

2235 Kinoshita, S. & Itagaki, S.
Studies on the nucleus of the spore in *Streptomyces*. Part II. Observations on the nuclear substances of the spore in *Streptomyces* which belong to B and C groups.
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1959 : **72** : No. 847 : 1–9.
Data are provided on nuclear size, shape and number in spores of *Streptomyces* spp. belonging to the above groups.

2236 Savinovskaja, A. A.
(The structure and functional significance of the nucleolus).
Uspehi Sovrem. Biol. (Advanc. in Mod. Biol.) 1958 : **46** : 156–73. [Russian].
Recent research on the morphological, chemical and physical properties and biological functions of the nucleolus in the cells of plants, animals and microorganisms is reviewed.

2237 Woods, P. S. & Schairer, M. U.
Distribution of newly synthesized deoxyribonucleic acid in dividing chromosomes.
Nature, Lond. 1959 : **183** : 303–05.
Earlier autoradiographic investigations by Taylor, Woods and Hughes [XXVII, 2508] indicated that after each replication of a chromosome the four resulting units separated so that each daughter chromosome contained one newly synthesized unit and one original unit of DNA. La Cour and Pelc [120] have suggested that colchicine may have been responsible for the unequal labelling of sister pairs in the second duplication, since this agent was present during the second synthesis and absent during the first in the experiment of Taylor *et al.* In order to clarify the situation, the experiment of La Cour and Pelc has therefore been repeated. Since critical quantitative data were lacking in this experiment, information on "grain" counts for daughter-chromosome pairs was collected and the χ^2 test applied to determine any significant deviations between daughter halves. Two seedlings of *Vicia faba* were grown in separate nutrient solutions containing tritiated thymidine. One solution also contained 0·03% colchicine. After 8 hr. the seedling treated with tritiated thymidine only was placed in a non-labelled solution containing 0·03% colchicine. After 6 additional hours two roots of this seedling were fixed, Feulgen stained and covered with autoradiographic stripping film. The other seedling was grown for 12 hr. in the solution containing labelled thymidine + colchicine. Two roots were then fixed and processed by the methods used for those of the first seedling. Since Fitzgerald *et al.* have shown that 90% of the β particles emitted by tritium are absorbed by filters (corrected to unit density) with a thickness of only 1·2 μ, labelled material would not be expected to register fully unless in direct contact with the photographic emulsion. Only the chromosomes observed by means of the phase-contrast microscope to be in direct contact with the emulsion were therefore scored, the first 25 chromosomes found to satisfy this criterion being scored in each of the four roots. Grain-count data on chromatid pairs confirmed the observations of Taylor *et al.* on the distribution of the labelling. The presence of colchicine during synthesis had no effect on the distribution of the labelled material. The authors suggest that differential absorption of tritium β particles by varying thicknesses of cytoplasm and other cellular components was not given sufficient attention by La Cour and Pelc.

2238 Guha, A.
Demonstration of chromosome like organization in the head of *Escherichia coli communior*-phage.
Naturwissenschaften 1958 : **45** : p. 425.
Electron micrographs revealed that the head of this phage contains two fine threads bearing granules arranged in a linear manner. The smaller of the two threads is situated in the centre of the head and the larger thread is in the periphery; this latter thread shows a central split. The threads withstood mild treatment with HCl. It is suggested that these threads are organized structures similar to the chromosomes of higher organisms.

2239 Giménez Martín, G.
Nota sobre una estructura policromomérica en centrómeros de *Scilla liliohyacinthus* L. **(Note on a polychromomeric structure in centromeres of *S. liliohyacinthus* L.).**
Phyton, Vicente López 1958 : **11** : 139–42.
In studies of root-tip chromosomes in *S. liliohyacinthus*, the centromeric region appeared to be composed of two parallel strands, one attached to each chromatid. On each strand, 5–6 equidistant chromomeres alternated with filamentous zones, giving the appearance of a string of beads.

2240 Schmitt, F. O.
Chromosomy, geny i makromolekularne układy. (**Chromosomes, genes and macromolecular systems**).
Postępy Nauk Roln. 1956 : **3** : No. 6 : 75–79.

This is a Polish version of an article abstracted earlier [XXVIII, 1126].

2241 Koopmans, A.
Het Negende Internationaal Congres voor Celbiologie te St. Andrews (28 Aug.—3 Sept. 1957). [**The Ninth International Congress on Cell Biology at St. Andrews (28 Aug.—3 Sept. 1957)**].
Genen en Phaenen 1957 : **2** : 78–80.

Brief summaries are given of some of the papers read at the above congress, including the following. In Optical studies on chromosome structure, F. Ruch reported that ultraviolet absorption studies indicate that DNA is present both within and between the spirals of metaphase chromosomes. It was concluded that no matrix was present. Speaking on An electron microscope study of different samples of DNA, R. Vendrely, C. Vendrely and C. Sadron reported that, in an aqueous solution, DNA has a globular form while in sodium chlorate it appears thread-like.

2242 Konarev, V. G.
(**Heterogeneity of nuclei, arising by means of amitosis**).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1958 : **122** : 297–99. [Russian].

Amitotically reproducing cells in the outer scales of *Allium cepa* were fixed in the usual manner and then subjected to N HCl for 10–40 minutes at 20° C before staining with methylene green and pyronin. It was found that the DNA in the nuclei of the mother cells was more stable to the action of depolymerizing agents than the DNA in the nuclei of the daughter cells.

2243 Taylor, J. H.
The mode of chromosome duplication in *Crepis capillaris*.
Exp. Cell Res. 1958 : **15** : 350–57.

The DNA of chromosomes in root cells of *Crepis capillaris* was labelled with thymidine–H^3. At the first division following the incorporation of the label, all the chromosomes were found to be labelled. After one duplication in the absence of the labelled precursor, all the chromosomes yielded one labelled and one unlabelled daughter chromosome. This indicated that the chromosomes consisted of two strands before duplication. Similar behaviour has been observed in other plants. Also some *Crepis* chromosomes fixed 5–7 hr. after the roots began growing in thymidine–H^3 showed a gradient in the concentration of tritium, the least amount of the isotope being found at the ends of the chromosome and most near the centromere. It is suggested that duplication begins at the ends and progresses regularly towards the centromere.

2244 Coutinho, L. de A. & García, M. L.
Existência de períodos de actividade e de repouso da mitose em "*Vicia faba* L" após tratamentos com Co^{60}. (**Existence of periods of activity and of rest in mitosis of *V. faba* L. after treatment with Co^{60}**).
Genet. iber. 1958 : **10** : 129–47.

Different leaf-bud meristems of a single plant were treated with doses of 86·4, 192 and 780 r. from Co^{60}. In each case, the percentage of cells undergoing division decreased to a minimum, not in the first mitotic cycle, but in the second, about 24 hours after treatment. Thereafter the percentage division showed alternate rises and falls, with an overall increase; for the two lowest doses the level finally reached that of the untreated control. The minimum values decreased with increasing dose and the staining capacity of the chromatin increased with increasing percentage division.

2245 Alov, I. A.
(**The question of the interrelationship between mitosis and amitosis**).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) Ser. Biol. 1958 : No. 4 : 403–07. [Russian].

Mitosis, amitosis and intermediate forms of cell division have been observed in animal cells and are discussed in relation to the nucleic acid metabolism of the cell.

2246 Young, I. E. & Fitz-James, P. C.
Pattern of synthesis of deoxyribonucleic acid in *Bacillus cereus* growing synchronously out of spores.
Nature, Lond. 1959 : **183** : 372–73.

Synchrony in the first two divisions of the germinated spores was achieved without recourse to artificial treatment, so that interference in DNA synthesis did not affect the observations as has been the case in some earlier investigations by other workers. At the beginning of division, each cell contained about $2\frac{3}{4}$ times the average amount of DNA found in the original spore, and at the end of division $1\frac{1}{2}$ times this amount. Each new cell therefore contained $1\frac{1}{2}$ times the amount of DNA in the

original spore. After division, synthesis continued in a linear fashion but at a slightly greater rate than before, until each new cell entered division with $2\frac{3}{4}$ times the amount of DNA in the original spore. Duplication and separation of the nuclear bodies thus occur midway between the divisions and during a period of continuous synthesis of DNA.

2247 Burns, V. W.
Synchronized cell division and DNA synthesis in a *Lactobacillus acidophilus* mutant.
Science 1959 : **129** : 566–67.

Use was made of a mutant with a block at the deoxyriboside stage of DNA synthesis, synchronization in division being effected by withholding deoxyriboside from otherwise normally nourished cells and subsequently supplying it. A time lag occurred between restoration of deoxyriboside supply and the first synchronous division. During this lag the amount of DNA per cell increased in a stepwise fashion and mass per cell increased linearly with time. The onset of cell division was preceded by cessation of DNA synthesis and an abrupt increase in the rate of cell-mass synthesis.

2248 Duncan, R. E. & Persidsky, M. D.
The achromatic figure during mitosis in maize endosperm.
Amer. J. Bot. 1958 : **45** : 719–29.

Using centrifuged suspensions of 14-day-old endosperm, spindle development was investigated by defining 17 "activity classes" during prophase to telophase and measuring various structural features of each figure, the information thus obtained being presented graphically so as to relate changes in the dimensions of spindle attributes with time. The first manifestation of the spindle was the adherence of radially oriented fibrous material round the nucleus at early prophase. The polar caps were completely formed by late prophase. During the transition from metaphase to anaphase, the spindle underwent shortening and apparent broadening. The spindle elongated throughout anaphase, although not at a uniform rate. Possibly about 46% of the separation of the two groups of sister chromosomes at anaphase may be attributed to elongation of the interzonal region (space between the two groups of chromosomes) and 54% to shortening of the chromosome fibres. The latter figure does not however represent all the shortening of the chromosome fibres, since some occurred before centromere separation. With the end of anaphase, the chromosome fibres disappeared and the interzonal region ceased to elongate and was occupied by the phragmoplast. Unlike the chromosome fibres, those of the interzonal region at early anaphase and of the phragmoplast were easily fragmented by pressure on the cover slip. The sister nuclei showed maximum separation in early telophase and then approached each other as cytocinesis proceeded. The spindle is considered as owing its origin to the same forces as those governing the production of a tactoid, these forces being operative until the end of metaphase. Shortening of the chromosome fibres was associated with the appearance of less oriented material in the polar region. Eventually this material was lost, presumably as the result of solation and diffusion to the interzonal region where the interzonal body was being formed, prior to the function of this region as the phragmoplast. The straightness of the fibres in the interzonal region throughout the initial period of elongation of interpolar distance suggests that during this part of anaphase the interzonal region is under tension as the chromosomes separate. At this time, the interzonal body merely kept pace with the increase in distance between the chromosome groups. Subsequent to a lag in the elongation of interpolar and interzonal distances, a second less marked increase in the rate of elongation occurred. At this stage, the interzonal fibres were longer and curved, the entire body having a barrel-like configuration. Such a broadening may be interpreted as being brought about by pressure at its poles as the body elongated or, if this body is a tactoid, as an expression of its growth.

2249 Bakerspigel, A.
The structure and manner of division of the nuclei in the vegetative mycelium of *Neurospora crassa*.
Amer. J. Bot. 1959 : **46** : 180–90.

The vegetative nuclei of *N. crassa* do not undergo typical mitosis. Instead, as division proceeds, the chromatin consists of a complex of chromosomal filaments and subsequently contracts into an irregular-shaped granular bar, which separates at the mid-region into two portions, these moving apart without the aid of a visible spindle. Individually recognizable chromosomes were not observed to align themselves on a metaphase plate. The central body begins to elongate before or after the complete separation of the two portions of chromatin and divides by constriction at the mid-region. Thus at the end of division, each sister nucleus is composed of a portion of the original chromatin and central body. It is suggested that both

the elongating central body and a densely-stained granule observed in the chromatin play a part in the separation of the two portions of chromatin. Seen in interdivisional nuclei, this granule was usually doubled by the time the dividing chromatin had assumed the shape of an irregular bar.

2250 Bailey, P. C.
The influence of some atmospheric gases upon the rate of mitosis in root tips of *Trillium sessile* L.
Cytologia, Tokyo 1958 : **23** : 211–17.

Decreases in the percentage of dividing nuclei occurred as the result of exposure for varying periods to (1) a slow continuous stream of carbon dioxide bubbled through the water in which the roots were suspended, (2) increased supply of oxygen and (3) increased supply of nitrogen. Mitosis was blocked during prophase and metaphase in the case of each of the three treatments. The effects of carbon dioxide were probably attributable to the 4·2 pH of the water after treatment [cf. XXVIII, 3755–56]. After oxygen treatment the mitotic figures showed some abnormalities, comprising telophase bridges, a "laking" of the chromosomes during metaphase and anaphase and an apparent dissolution of the matrix surrounding the anaphase chromosomes. The only marked effect of nitrogen on the mitotic figure was excessive chromosome contraction at metaphase.

2251 Truhaut, R. & Deysson, G.
Sur les propriétés antimitotiques de l'oxyde de bis-(β-chloréthyle) comparées à celles de ses homologues au soufre (ypérite) et à l'azote ("moutarde azotée").
[**On the antimitotic properties of bis-(β-chlorethyl) oxide compared with those of its sulphur homologue (mustard gas) and nitrogen homologue (nitrogen mustard)**].
CR Acad. Sci., Paris 1959 : **248** : 732–34.

The first of the above substances, tested on onion root tips, has an antimitotic activity about 100 times smaller than that of the other two and lacks their radiomimetic action.

2252 Nanetti, L. & Marras, G.
Impiego del "test" *Allium cepa* L. per dimostrare l'attività citologica esplicata dall'acetato talloso. (**Use of the *Allium cepa* L. test to demonstrate the cytological activity exerted by thallium acetate**).
Boll. Soc. ital. Biol. sper. 1956 : **32** : 1552–55.

Solutions at concentrations of 0·1 M/l. and 0·001 M/l. had a marked antimitotic activity on onion root-tip cells. With the higher concentration, mitosis ceased entirely after 24 hours' immersion.

2253 Cohn, N. S. & Merz, T.
A technique for the sterile culture of roots.
Nature, Lond. 1959 : **183** : 412–13.

Details are given of a method which has been devised for use in investigations of the effects of metallic ion deficiencies or excesses on chromosome structure and which has been applied to roots of *Vicia faba* and *Allium cepa*. In addition to maintaining control of cell nutrition, the technique makes possible the use of clonal lines of tissue for cytological studies.

2254 Cohn, N. S.
The effective wavelength promoting light reversal of carbon monoxide-inhibited chromosome rejoining.
Exp. Cell Res. 1959 : **16** : 424–27.

It has previously been shown that carbon monoxide prevents the restitution of X-ray-induced chromosome breaks [cf. XXVIII, 1376]. This effect is light reversible. Using young roots of *Allium cepa* bulbs, it was found that only light in the wave-length range 400–475 mμ can reverse the effect of carbon monoxide. This result supports the suggestion that carbon monoxide forms a complex with cytochrome oxidase, thereby inhibiting chromosome restitution.

2255 Merz, T.
The effect of extended anaerobic treatments on the chromosomes of *Vicia faba*.
J. biophys. biochem. Cyt. 1959 : **5** : 135–42.

The frequency of breakage induced in root-tip cells of *V. faba* by X irradiation (100 r.) following pretreatment with N_2 for 3 hr. was considerably higher than the frequency obtained as the result of N_2 pretreatment for 5 min. + the same dose of X rays. The frequency of breakage after treatment only with N_2 for 3 hr. was very much higher than the frequency of spontaneous aberrations. The frequencies of the different categories of aberrations induced by irradiation after N_2 pretreatment for 3 hr. were about equal to those obtained by adding the frequencies resulting from N_2 treatment for 3 hr. alone and from pretreatment for 5 min. + irradiation. The effect of the 3-hour treatment was about the same as that after the short N_2 pretreatment

+ irradiation. Further experiments demonstrated that the observed influence of anoxia was actually due to oxygen starvation and not to the induction of an unstable state which resulted in chromatid breaks in the presence of O_2 during recovery. In order to ascertain whether the inconsistencies found between and within extended treatments with N_2 only, with respect to the frequencies of aberrations, were due to differences between roots in ability to produce energy through glycolysis in the absence of oxidative metabolism, an inhibitor of fermentation (NaF) was used in combination with N_2. The frequencies of aberrations after the combined treatments were generally higher and considerably less variable. Although other hypotheses may account for the effect of NaF, the hypothesis most compatible with the evidence is that the effect is due to energy deprivation. It is suggested that chromosomal damage under conditions of a lack of energy may be the result of (1) a build-up of normal cellular compounds to abnormally high concentrations which would have a direct or indirect action on the chromosomes, (2) the breakdown of DNA as a source of energy and (3) the possible requirement of energy on the part of chromosomes in order to remain intact.

2256 Heller, J. H. & Teixeira-Pinto, A. A.
A new physical method of creating chromosomal aberrations.
Nature, Lond. 1959 : **183** : 905–06.

Recent experiments at the New England Institute for Medical Research, Ridgefield, Conn., have indicated that a wide range of effects on biological material may be obtained through use of a radio-frequency source in the megacycle range. In order to minimize dielectric heating, it was necessary to reduce the mean power input. A pulsed radio-frequency source at 27 Mc./s. was therefore employed. For genetical and other studies, insulated electrodes separated by an air gap of 3–15 mm. were coupled to the primary radio-frequency source, the peak-to-peak voltage being about 1000–1500 V. When garlic root tips growing in water were placed in a field between the electrodes for 5 min. and examined 24 hr. later, aberrations such as linear shortening of the chromosomes, pseudochiasmata, amitotis and bridges were observed. The effects upon the chromosomes resembled those of ionizing radiation and c-mitotic substances. The technique is regarded as a new means of inducing aberrations, depending upon the frequency, pulse, power, time of exposure and the relationship between the cell axis and the field.

2257 Kihlman, B. A.
Induction of structural chromosome changes by visible light.
Nature, Lond. 1959 : **183** : 976–78.

Aberrations (isolocus breaks and exchanges) were induced by visible light in root tips of *Vicia faba* pretreated with acridine orange as a sensitizing agent. This effect was however marked only when the gas bubbled through the solution in which the roots were immersed contained more than 20% oxygen. The induction of aberrations therefore appeared to be a typical photodynamic effect, possibly involving the formation and action of organic peroxides. Further experiments were carried out to determine whether aberrations may be induced photodynamically at lower oxygen concentrations when respiration is inhibited, using cupferron as inhibitor. Aberrations were produced with the highest frequency when oxygen-free nitrogen was bubbled through the solution. No support was therefore gained for the hypothesis concerning the role of peroxides.

2258 Moh, C. C. & Withrow, R. B.
Nonionizing radiant energy as an agent in altering the incidence of X-ray-induced chromatid aberrations. II. Reversal of the far-red potentiating effect in *Vicia* by red radiant energy.
Radiation Res. 1959 : **10** : 13–19.

A 3 hr. pretreatment with far-red radiant energy given in a wave band from 715 to 940 mμ with an irradiance of 3000 μw/cm.^{2} increased the frequency of X-ray-induced chromatid breaks and exchanges in *Vicia* root tips by about 40% as compared with that of control root tips which were subjected to X-ray treatment alone, the X-ray treatment being of 100 or 120 r. in all experiments. No increase in the frequency of chromatid aberrations was observed when red energy from 620 to 680 mμ at an irradiance of 200 μw/cm.^{2} was applied for 3 hr. either simultaneously with or immediately after the far-red treatment; the red energy is able to nullify or reverse the far-red potentiating effect.

2259 Demarly, Y.
Contribution à l'étude des tétraploïdes. (**A contribution to the study of tetraploids**).
Ann. Génét. 1958 : **1** : No. 1 : G.25–G.39.

Meiosis in tetraploid plants is analysed mathematically. Using matrix calculus it is shown that pure lines of tetraploid plants cannot be obtained; however it is possible to determine how many selfed generations must be bred in

order to attain a certain degree of homozygosity. Also the number of selfings required to fix certain morphological characters in a tetraploid line may be calculated. It is pointed out that a mathematical study of the homogenization of chromosome segments can throw light on inbreeding depression in tetraploids.

GENERAL BOTANY

2260 Penrose, L. S.
Automatic mechanical self-reproduction.
New Biol. 1959 : No. 28 : 92–117.

Models comprising hooked plywood units arranged linearly along a track have been designed, in which, under the influence of shaking, the units become attached or loosened from one another and thereby mimic such biological processes as assimilation, reproduction and segregation. The light thrown by the experiments on current views on the replication of cells and their components is discussed.

2261 Christ, B.
Entwicklungsgeschichtliche und physiologische Untersuchungen über die Selbststerilität von *Cardamine pratensis* L. (**Ontogenetical and physiological investigations on the self sterility of *C. pratensis* L.**).
Z. Bot. 1959 : **47** : 88–112.

This work carried out at Cologne University revealed that the self-sterility reaction of *C. pratensis* is located on the upper surface of the stigma. After selfing, both the rate of germination and the growth of the pollen tubes are reduced, whereas compatible pollen quickly germinates and penetrates into the stigma. When the air humidity is raised, the germination and growth of self pollen is no longer inhibited but the tubes are still not able to pass into the stigma.

It is suggested that the pollen normally needs to take water from the stigmatic papillae in order to germinate. The pollen is thought to have an enzyme which dissolves the cuticle of the stigma, so making it permeable to water; also removing the cuticle enables the pollen tubes to grow into the stigma. The enzyme concerned may be present in an active form in both kinds of pollen but is inhibited by a substance secreted from a stigma having the same sterility allele or the pollen may contain an inactive form of the enzyme, which becomes activated on a stigma carrying a different sterility allele.

2262 Bubar, J. S.
Differences between self-incompatibility and self-sterility.
Nature, Lond. 1959 : **183** : 411–12.

With particular reference to *Lotus* spp., the author indicates the importance of recognition that self incompatibility and self sterility may be distinct phenomena controlled by independent genetic systems. He also draws attention to the significance of the possibility of separating self incompatibility from self sterility in breeding *L. corniculatus* and other legumes.

2263 Thomas, C. A. (Jun.)
The release and stability of the large subunit of DNA from T_2 and T_4 bacteriophage.
J. gen. Physiol. 1959 : **42** : 503–23.

T_2 or T_4 phage was subjected to osmotic shock or chemical treatment to release the encapsulated DNA. Autoradiographic analysis of the material thus obtained revealed the presence of one large subunit of DNA (molecular weight 54×10^6) for each former phage particle. Some smaller subunits with a molecular weight of 12×10^6 were also detected. The large subunit was sensitive to very small amounts of DNase, resistant to the action of mixed proteases and incapable of being dispersed by banding by CsCl in gradient centrifugation. The observed sensitivity to fragmentation by P^{32} decay and increase in this sensitivity subsequent to heat treatment are regarded as being most satisfactorily explained by assuming that the large subunit is a duplex of polynucleotide strands. The question of whether very small nonDNA links connect DNA duplexes in tandem is considered.

2264 Thomas, C. A. (Jun.) & Knight, J. H.
The sedimentation properties of the large subunit of DNA released from labeled T_4 bacteriophage.
Proc. nat. Acad. Sci. USA 1959 : **45** : 332–34.

"The sedimentation constant of the large subunit of DNA (LSU) which can be released from P^{32}-labeled bacteriophage has been determined. The value of the constant (41*S*) is just the magnitude expected for a DNA molecule at 45×10^6 molecular weight." The LSU is of interest because of the possibility that it constitutes a viral chromosome.

2265 Suzuki, K. & Ono, J.
Biochemical heterogeneity of the ribonucleic acid synthesized by *Escherichia coli* B after irradiation with ultra-violet light.
Nature, Lond. 1959 : **183** : 395–96.

Haas and Doudney have recently suggested that mutation in *E. coli* is induced by ultraviolet radiation as the result of the incorporation of modified nucleic-acid precursors into RNA, which in turn thus becomes modified [XXVIII, 1169, 3709]. The authors have therefore carried out investigations to determine whether RNA synthesized after irradiation undergoes modification. Their results suggest that, although the incorporation of P^{32} into the RNA fraction may occur after ultraviolet irradiation, the fraction is composed of two parts, one stable and the other unstable. The addition of chloramphenicol or dinitrophenol to the medium or omission of glucose had no effect on P loss in the unstable fraction. Chemical differences between normal RNA and that synthesized after ultraviolet treatment are now under investigation.

2266 Bonner, J.
Protein synthesis and the control of plant processes.
Amer. J. Bot. 1959 : **46** : 58–62.

The role of microsomes in protein synthesis is discussed; they seem to provide the means whereby information contained in the DNA of the nucleus is utilized in the synthesis of soluble cytoplasmic enzymes.

2267 Golubinskij, I. N.
(The question of viability of the pollen gathered by bees).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 1 : 26–27. [Russian].

The writer agrees with Knyš that pollen carried over some distance by bees becomes inviable because it dries up [cf. 829]. His own observations at Mičurinsk and Kostopol' suggest an additional cause for the loss of viability by the pollen of diverse plants, including lucerne; it is the presence of phytocides in the liquid with which the bee forms the pollen into small lumps.

2268 Yamada, Y.
The effect of cobalt on the growth of pollen I.
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1958 : **71** : 319–25.

Experiments on the effect of two chelating agents, ethylenediamine tetraacetate (EDTA) and 8-hydroxyquinoline, and various metallic sulphates on the growth of *Lilium* pollen are reported. The first two substances are toxic though the first has a stimulative effect at low concentrations (10^{-5} M). Copper sulphate stimulated pollen tube growth at 10^{-6} M while cobalt sulphate had a pronounced stimulative effect at concentrations of 10^{-5} and 5 x 10^{-4} M. Moreover, cobalt sulphate had an antagonistic effect on the toxic action of the two chelating agents.

CROP PLANTS

2269 Scarascia, G. T. & D'Amato, F.
Applicazioni delle scienze nucleari in agricoltura e alimentazione nel Regno Unito. **(Applications of nuclear science in agriculture and nutrition in the United Kingdom).**
Agricoltura Ital. 1958 : **58** : 315–27.

A report is given of a visit to a number of centres in the United Kingdom under the auspices of OEEC, special attention having been paid by the authors to questions of plant physiology and cytogenetics.

Deuxième Colloque International sur la Qualité Végétale, Paris, le 24–27 avril, 1957. **(The Second International Colloquium on Plant Quality, Paris, 24-27 April, 1957).**
Qual. Plant. Mater. veg. 1958 : **3/4** : 1–610.

2270 *Schuphan, W. Différences génétiques de qualité des protéines et de teneurs en aminoacides indispensables chez les végétaux alimentaires. (Genetical differences in the quality of the proteins and in the contents in essential aminoacids in food plants). (pp. 34–44).*

Differences in the nutritive value of various types of *Brassica oleracea* are mentioned; for example the biological value of the protein, as shown by its aminoacid content, in kale is much higher than that of protein from white cabbage. An investigation of 15 potato varieties revealed marked differences in the biological value of the protein; no correlation was found between the yield of crude protein and its biological value. Differences between malting barleys in respect of the composition of the protein were found to be relatively small [cf. XXVII, 1778].

2271 *Portères, R. Agronomie et supplémentation végétale d'une alimentation à base de céréales sous les tropiques. (Agronomy and the supplementation with vegetables of a diet based on cereals in the tropics). (pp. 114–23).*

Suggestions are made concerning the breeding

of leguminous vegetables suited to the requirements of people living in tropical regions where the diet is unbalanced.

2272 *Adda. Teneurs en amino-acides des différentes variétés de pénicillaires et de sorghos du Sénégal.* (*The content of aminoacids of the different varieties of* Pennisetum *and* Sorghum *of Senegal*). (*pp. 138–51*).

Data are provided on the aminoacid composition of protein from the grain of varieties and species of *Sorghum* and *Pennisetum* grown at Bambey. The highest contents of lysine were found in *S. guineense*, *P. maiwa* and *P. pycnostachyum*. In *P. pycnostachyum*, pedigree selection improved the lysine content.

2273 *Tavernier, J. La vitamine C dans les fruits à pépins.* (*Vitamin C in pome fruits*). (*pp. 166–77*).

This brief account of studies carried out in various countries on the ascorbic-acid content of pears and apples includes tabulated data on the chemical composition of 36 apple varieties. Marked differences have been found in the vitamin C content of apple varieties but pears do not vary so much in this respect.

2274 *Peynaud, E. La vitamine C dans les fruits à noyau.* (*Vitamin C in stone fruits*). (*pp. 184–91*).

Information is provided on the vitamin C content of a large number of peach and plum varieties grown at the Experimental Station of Villenave d'Ornon near Bordeaux. In the peach varieties the ascorbic-acid content varied from 6 to 59 mg. per 100 g. of fresh fruit; in the plum varieties the corresponding values ranged from 0·8 to 23 mg.

2275 *Bogdanski, K. A. Teneur en vitamine C de 26 variétés de fraises.* (*The content of vitamin C of 26 strawberry varieties*). (*pp. 210–26*).

Of the varieties tested at Skierniewice, Poland, Purpuratka [Purple] and Afryka had the highest contents of vitamin C. The effect of various freezing treatments on vitamin C content was investigated in some of the varieties.

2276 *Mackinney, G. Inheritance of carotenoid differences in the tomato.* (*pp. 281–90*).

The effects of five genes determining carotenoid differences in tomato fruit are discussed.

2277 *Manunta, C. Fisiogenetica della pigmentazione nei pomodori e selezione per ricchezza in vitamina C ed in β-carotene.* (*Physiogenetics of the pigmentation of tomatoes and selection for richness in vitamin C and in β-carotene*). (*pp. 291–316*).

A full summary of the author's work on the above topics is provided; accounts of this research have appeared elsewhere in *Plant Breeding Abstracts*.

2278 *Bienaymé, A. & Servant, M. Variations des caractéristiques des huiles de palme et notamment de leurs caroténoides.* (*Variations of the characteristics of palm oils and in particular of their carotenoids*). (*pp. 336–53*).

For two years, monthly analyses were made of the oil from palms growing at 15 stations in French, Portuguese, and Spanish territories in Africa and in British Malaya. The highest iodine numbers of 57–60 were found in oils from natural populations growing on the Ivory Coast. Natural populations in Togo, Dahomey and Portuguese and French Guinea had oils with iodine numbers of 54–56; these oils are richer in carotene than those from the Ivory Coast.

Selected trees of the *dura*-deli race from both the Far East and the Ivory Coast were poor in carotene and had iodine numbers of 52–53. All the races tested from regions south of the Equator in Africa gave oils with iodine numbers of 53–55; these oils were also poor in carotene.

2279 *Boukin* [*Bukin*], *V. N. Notes on the study of vitamins in plants.* (*pp. 374–80*).

A brief mention is made of some successes gained in the USSR with respect to improving the vitamin content of crop plants. Varieties of apple and wild rose with a high content in vitamin C and adapted to the northern regions of the USSR have been bred. Also a pumpkin with greatly increased carotene content has been produced.

2280 *Gebauer, H. Vitamin E und B in Pflanzen.* (*Vitamins E and B in plants*). (*pp. 381–92*).

Tabulated data are provided on the content in oil and tocopherol of eight varieties of sweet pepper.

2281 *Durquety, P. M. La génétique des anthocyanes des raisins.* (*Genetics of the anthocyans of grapes*). (*pp. 500–07*).

Three types of anthyocyanin complement have been found in fruit of the genus *Vitis*. Type A, occurring in *V. vinifera*, is characterized by a

preponderance of the monoglycosides of malvidin, petunidin and delphinidin which have 3 OH groups in the 3′, 4′ and 5′ positions; type B, found in *V. riparia*, has diglycosides of the same substances. *V. aestivalis* has type C; it comprises monoglycosides of the substances already mentioned and also cyanidin and peonidin which have 2 OH groups on the side ring.

Crosses between varieties with different anthocyanins indicated the existence of a dominant factor, designated *G*, responsible for the formation of diglycosides, *g* being responsible for the production of monoglycosides. It is also suggested that the formation of triphenols and diphenols may be determined by a pair of factors *O* and *o* respectively; this possibility requires further investigation.

2282 Moyal, M.
Plant breeders.
Contemporary Rev. 1959 : No. 1118 : 123–26.

Some of the difficult problems solved by plant breeders are high-lighted for the benefit of the general reader.

2283 Yapp, W. B. & Watson, D. J. (Editors).
The biological productivity of Britain.
Institute of Biology, London 1958 : 25s. : Symposium No. 7 : Pp. vii + 126 : 4 figs. : 11 tables.

A record is provided of the papers and discussions contributed to a symposium sponsored by the Institute of Biology and held in London during October 1957, to consider various aspects of animal and crop production. Two contributions are of especial interest to crop breeders. In Improvements in crop production, G. D. H. Bell examined in general terms the role and methods of breeding. In Factors limiting production, D. J. Watson discussed photosynthetic problems. Among the aspects considered is the possibility of increasing productivity dependent on photosynthesis by breeding. The view is expressed that in general such improvement is likely to result mainly from increased leaf growth rather than higher photosynthetic efficiency.

2284 Das Institut für Kulturpflanzenforschung im Jahre 1957. (**The Institute for Research in Crop Plants in 1957**).
Kulturpflanze, Berlin 1958 : **6** : 7–37.

The work referred to in the report includes a visit to the soya-bean growing district of China, where varieties were collected for hybridization experiments; also varietal trials in cooperation with the Agricultural Institute at Harbin were started. Studies of mutants of soya bean, tomato, barley and pome fruits were continued. Also research on heterosis in maize, the genetics of pigment formation in *Cucurbita pepo* and the artificial induction of chromosome aberrations in *Vicia* was carried out. Studies on *Proteus* with especial reference to penicillin resistance were effected. Other cytogenetical work and forest-tree selection are also mentioned.

2285 Stubbe, G. [H.]
(**Position and development of research on plant genetics in the German Democratic Republic**).
Bot. Ž. (Bot. J.), Moskva 1958 : **43** : 1362–77. [Russian].

An outline is given of the activities carried on by the various institutes administered by the Academy of Sciences and the Academy of Agricultural Sciences in Berlin [cf. XXVIII, 1244]. A large part of these activities is devoted to research on artificially induced mutants, polyploids and haploids, on the role of mutants in evolution and on interspecific and intergeneric crosses in smut fungi, tomatoes, strawberries and various cereals, fruit trees and forest trees. Studies have been made on the nature of heterosis, on cytology and on the genetics of economically important characters in various agricultural plants and forest trees. Extensive experiments on graft hybridization in a number of different plants have given no evidence of the transmission of characters from the stock to the scion or of increased crossing capacity in the grafted partners. Attempts to convert winter wheats to spring by spring sowing were unsuccessful when true winter wheats were used. Some wheats segregated in spring sowings, giving a certain proportion of spring types; these were morphologically similar to the winter types and the fact that the variety constitutes a population of mixed physiological constitution is only revealed when the variety is sown in spring. It is thought that the results reported by Soviet investigators may be due to a similar process.

2286 Stubbe, H.
Über einige grundsätzliche Fragen zu der bisherigen und zukünftigen Arbeit der Deutschen Akademie der Landwirtschaftswissenschaften zu Berlin. (**Some basic questions concerning the work to date and the future work of the German Academy of Agricultural Sciences in Berlin**).
Dtsch. Landw., Berl. 1958 : p. 58.

The questions discussed in this presidential

address to the third plenary meeting of the Academy include the setting up of various international commissions for the solution of certain problems of common interest to a number of countries. One of these is for potato problems and envisages the division of labour in research connected with potato breeding and cultivation and the adoption of standardized methods of field experimentation. A second is concerned with seed production of certain vegetables and forage plants in southern regions of the Soviet Union and Hungary and another provides for the collection of local forms of cultivated plants and related primitive and wild species, potatoes and forest trees being mentioned particularly.

2287 Schick, R.
100 Jahre landwirtschaftliche Pflanzenzüchtung in Deutschland. (**100 years of agricultural plant breeding in Germany**).
SB dtsch. Akad. LandwWiss. Berl. 1958 : 7 : No. 2 : 1–21.

In this survey the various causes which led to the development of organized plant breeding in Germany are outlined; past and present work on sugar beets, potatoes, cereals and forage and oil crops is reviewed. A special tribute is paid to Lembke's work, this paper having been presented on the occasion of his 80th birthday.

Jahrbuch 1957 der Bundesanstalt für Pflanzenbau und Samenprüfung in Wien. (**1957 year book of the Federal Institute for Plant Cultivation and Seed Testing, Vienna**).
Bodenkultur 1958 : 9. Sonderheft : Pp. 192.

2288 *Bauer, R. Tätigkeitsbericht* 1957. (*Report on activity, 1957*). (*pp. 1–14*).

The results of varietal trials of cereals, leguminous forage plants, potatoes, mangels, sugar beet and rape are briefly reported.

2289 *Waltl, K. Tätigkeitsbericht der Qualitätsabteilung.* (*Report on the activity of the Quality Department*). (*pp. 49–59*).

The results are reported of tests on the malting quality of barleys and milling quality of winter wheats.

2290 *Nietsch, H. Botanische Sortenbeschreibungen.* (*Botanical descriptions of varieties.* (*pp. 61–62*).

Morphological data are provided on ten old winter rye varieties and one spring rye and one oat variety recently entered on the Austrian official list. Each of the varieties described is illustrated.

2291 *Meinx, R. Hafer—Ergebnisse mehrjähriger Sortenprüfung.* (*Oats—results of several years' varietal trials*). (*pp. 82–97*).

Information is provided on the yielding capacity, maturity period, length of stalk, standing capacity and fodder value of 22 varieties tested in various districts of Austria.

2292 *Demel, J. Kartoffelsorte und Sortierung.* (*Potato variety and grading*). (*pp. 122–36*).

A report is presented of investigations conducted at three Austrian centres during 1954–57 on the size and weight of tubers from eight early and seven late varieties. Marked varietal differences were found in tuber size and in the number and weight of tubers produced by a single plant. For the early varieties, the average number of tubers per plant was 15·9 and the weight 810 g.; the late varieties yielded about 16·6 tubers of total weight 960 g. A high tuber number was not always accompanied by a high yield. The early culinary varieties Saskia and Oberarnbacher Frühe [Oberarnbach Early] produced a small number of large tubers and are therefore particularly suitable for early forcing. The late varieties Maritta and 474/51 gave a high proportion of large tubers and a good yield.

2293 *Graf, A. Wert der Ploidiebestimmung in Saatgut und Feldbeständen polyploider Zuckerrübensorten.* (*The value of determining the ploidy in seed and field crops of polyploid sugar beet varieties*). (*pp. 137–59*).

The importance of comparing the performance of diploid, triploid and tetraploid sugar beet under different conditions is pointed out. For this purpose a rapid and reliable method for distinguishing between the three types is required. A method based on that of Reitberger has been found satisfactory for dealing with large numbers of plants. Reitberger's method involves counting the number of trabant chromocentres in resting nuclei of epidermal cells of the leaf [cf. XXVII, 643]. Instead of using normal acetocarmine as Reitberger did, acetocarmine containing iron is used for the cytological stain; under these conditions, the stain solution does not require warming. It was found convenient to germinate the seed in earth and use two or three day old cotyledons for the cytological investigation.

The results are reported of investigations on the proportion of the different genome types in seed and field crops of several polyploid varieties. Triploids gave better performances than diploids or tetraploids of the same variety.

2294 **(For further progress of Mičurinist agrobiology. A report on a conference of the Czechoslovak Academy of Agricultural Sciences dedicated to questions of Mičurinist agrobiology).**
Za socialist. sel'skohozjajstv. Nauk. (For socialist agric. Sci.), Praha : Ser. A. : 1958 : 7 : 331–48. [Russian].
This account of the conference cites the titles of papers read on plant breeding and related topics.

Proceedings of the Second Meeting of the Hungarian Biological Society, Szeged, May 19-21, 1958.
Acta biol., Budapest 1958 : Suppl. 2 : Pp. 40. (Absts.)

2295 *Koronczy-Wonnesch, I. & Uzonyi-Látkóczky, A. Some data on the strains of cultivated mushrooms.* (*pp. 13–14*).
Significant differences in yield have been found among 20 strains studied over a period of three years.

2296 *Horváth, J. & Buday, F. Effect of DNA on the antibiotic production of* Streptomyces. (*p. 19*).
DNA isolated from a strain of *S. globistrobus* described as having a wide bacterial spectrum was used to transform strains of *S. erythrochromogenes*, which affects only Gram-positive bacteria, *S. flaveolus*, which has a narrow bacterial spectrum, and *S. griseus* which normally does not produce antibiotics. For each strain the bacterial spectrum generally became wider but in some cases prolonged treatment completely destroyed the capacity for antibiotic production.

2297 *Bálint, A. & Kovács Schneider, M. Effect of self-fertilization on the vitality of plants and its evolutionary significance.* (*p. 22*).
When 1, 2 and 3 anthers per flower were left on spring wheat plants and 1, 5 and 10 anthers on pea plants, the respective seed sets were 65·9 92·6 and 100%. In both crops, plants grown from the seed of individuals with one anther per flower showed increased vegetative vigour, but in wheat there was a 9% decrease in yield.

2298 *Szende, K. Genetical basis of pentose-utilizing capacity of* Ustilago maydis. (*pp. 22–23*).
When plated on a xylose-agar medium, cells of a d-xylose-utilizing monosporidial line grown in a glucose medium show a heterogeneous lag phase lasting 3–15 days. The lag heterogeneity was eliminated after repeated passages on d-xylose suggesting that a selective mechanism resulting in the stabilization of the xylose-utilizing capacity was effective. There was evidence that the process of adaptation was discontinuous.

2299 Kuz'min, V. P.
(The results of research on breeding crop plants in northern Kazahstan).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 5 : 7–11. [Russian].
In addition to the crops referred to below, breeding work with *Setaria, Agropyron tenerum*, brome, lucerne, sainfoin, *Linum* and *Camelina* at various stations in northern Kazahstan is reported.
Wheat. Descriptions are given of many varieties, including the Kazah hard wheat standards Akmolinka 5 (wheat from Akmolinsk 5) and Kustanajskaja 14 and the soft wheat standards Akmolinka 1, Šortandinka (wheat from Šortandy) and Karaganda. The hard wheats are interesting mainly for their grain quality and resistance to insects, fungi and drought and the soft wheat for productiveness and resistance to disease or drought. Zolotaja Volna [Golden Wave], from [(Golubka [Dove] x Hordeiforme 186) x Caesium 111], Pseudohostianum 44, Erythrospermum 49/1, Milturum 45, Turcicum 2/51 and Lutescens 38 (Akmolinka 6 x Akmolinka 1) have reached an advanced trial stage. All these combine the high yield of the standard varieties with improved plasticity in respect of cultural conditions and satisfactory baking and milling properties.
Rye. Dolino was selected from a local variety at Karaganda and Zima [Winter] was bred by crossing a local variety at Šortandy with large-grained ryes from the Baltic provinces and Scandinavia. Both new ryes are winter hardy and give high yields.
Maize. New varieties have been developed, in particular the early-ripening Bidaikskaja 1, which is highly productive of grain and forage.
Barley. Medicum 8955, selected from a Central Asiatic sample of the Institute of Plant Industry, has been made a standard in five provinces of Kazahstan. It is characterized by high yield and resistance to drought and diseases.
Panicum. The recent millet selections Dolino 31 and Dolino 83, with a habit suitable for

combine harvesting, have been made standards in many areas.

Sunflower. Šortandy 5 and Šortandy 41 have been obtained by hybridization. Both ripen earlier than the standard Saratov 169, which they outyield and exceed in oil content.

2300 Kirillov, Ju. I. & Šmaraev, G. E.
(The Priaral'skaja Research Station is 25 years old).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 5 : 25–30. [Russian].

Breeding at Čelkar with a diversity of agricultural and horticultural plants including the crops listed below is mentioned.

Lucerne. High-yielding, hardy and drought resistant varieties have been developed. Worth mention is the variety Kiaktysaj, which was selected from wild material found around Kzyl-Orda.

Potato. Podarok Rodine [Gift to the Fatherland] and Novinka Pustyni [Desert Novelty] were obtained by clonal selection of unspecified varieties. Both are highly productive, with uniformly shaped tubers and shallow eyes and resistant to high temperatures and various forms of degeneration. They are fairly resistant to scab. Novinka Pustyni crops twice a year in the southern districts of Soviet Asia.

Onion. Zolotoj Šar [Golden Globe], selected from a cultivar originating in Orenburg, is referred to as "a valuable variety yielding up to 200 c. per ha."

Cucumber. Čelkar, selected from a Japanese cultivar, is interesting for tolerance of drought and high temperatures.

Tomato. Pjatidesjatidnevnyj [Fifty Days] is a productive midseason type highly resistant to diseases.

2301 Macjuk, L. S.
(A report on progress in biological and agricultural sciences in the Moldavian SSR).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) Ser. Biol. 1958 : No. 4 : 471–78. [Russian].

Breeding of agricultural, horticultural and industrial plants in Moldavia is mentioned. The results include high-yielding *Puccinia*-resistant varieties of wheat such as Kišenev 1, male-sterile forms of the maize line 44 used in the production of the double cross VIR42 [Institute of Plant Industry 42] and wart-resistant potato varieties.

2302 Niopek, J.
Betrachtung der schwedischen Pflanzenzüchtung mit näheren Ausführungen über Weibullsholm. **(A survey of Swedish plant breeding with more detailed statements on Weibullsholm).**
Saatgutwirtschaft 1958 : **10** : p. 338 : **11** : 14–17.

The important role played by plant breeders in improving crop production in Sweden is mentioned. Special attention is paid to plant breeding work at Weibullsholm. The chief varieties of the most important crops grown in Sweden are listed.

2303 Borg, Å.
Växtförädling i Örebro län — ett 70-årsjubileum. **(Plant breeding in the province of Örebro, a 70-years' anniversary).**
Sverig. Utsädesfören. Tidskr. 1958 : **68** : 203–19.

The history of breeding in the province of Örebro in central Sweden is surveyed. Begun in 1888 by the Central Swedish Seed Association, which was amalgamated in 1894 with the General Swedish Seed Association, breeding was suspended from 1897 until, in 1934, a substation of the Ultuna branch was formed there. The substation is concerned chiefly with varietal trials and tests of breeding material, but also carries out selection and breeding. Among recently developed material which has shown promise in Örebro are the winter wheat U52/538 (Odin x Eroica), spring wheats involving Norröna as parent, oats from Eho x Stormogul II [Great Mogul II] and the red clovers U057, selected from Merkur, U039, selected from the Hjälmarsnäs strain, and Sv034, a tetraploid.

2304 **Work of the Swedish Seed Association as planned for the years 1958-60.**
Sverig. Utsädesfören. Tidskr. 1958 : **68** : 254–78.

The programme of work of the Swedish Seed Association at Svalöf and branch stations includes: studies of breeding methods; breeding work with cereals, leguminous forage crops, potato, root crops, fibre plants, tobacco, hops, oil crops and pulses; plant introduction; induction of mutations; and study of biochemistry and quality of breeding material.

2305 Åkerberg, E.
Aktuellt från försöksfält och laboratorier. (**News from trial fields and laboratories**).
Sverig. Utsädesfören. Tidskr. 1958 : **68** : 306–22.

In this short survey of the current work of the Swedish Seed Association on diastase activity in cereals and on photosynthesis, water relations and disease resistance in both cereals and other crops, the following results are noted. Varietal differences in diastatic activity and in rate of photosynthesis have been detected in wheat. In oats, two types of nematode resistance have been isolated and in flax the two lines Sv029 and Sv0222 have proved almost completely resistant to rust. Mildew-resistant material has been found among some barley varieties and mutants but all the resistant mutants also showed chlorophyll defects. Among new and promising varieties mentioned are: the barley X-ray mutants Pallas and Tidig 8 [Early 8] and the malting variety Sv02102; the white clover Sv0424; the tetraploid red clovers Ulva and Sv034; the lucerne Tuna; the very winter-hardy reygrass Sv01408a; and the white mustard Sv54/122. [Cf. 165].

2306 Arbetsplan för Weibullsholms Växtförädlingsanstalt för år 1959. (**Plan of work for the Weibullsholm Plant Breeding Institute for the year 1959**).
Pp. 46.

Most of the recent results and future plans mentioned were described in last year's report [XXVIII, 2639]. In addition, the following work is referred to:—

Mutation. Oats, lucerne, kale, lettuce, tomato, pea and bean are being exposed to different types of radiation with the aim of inducing mutations.

Clover. Tetraploid forms have been induced in various red clover strains and are being crossed. The tetraploid Alsike clover Balingsta proved better than the best diploids in green-matter production.

Parsnip. Tetraploids of Viris and Tip Top have been produced.

Spinach. Tetraploids have been induced in some varieties and are to be used in the production of triploids.

Melon. The open-air variety Kalas has been crossed with varieties of better quality.

Cucumber. A new F_1 variety, Arla Wis/57, was released [cf. 789].

Phaseolus. Delikat and Rika received the designation first class in state trials [cf. 789]. Extensive material from Stella x *Ph. multiflorus* is undergoing tests.

Dill. A new, rapidly growing variety for forcing, Drivdill [Forcing dill], was released.

Tien-jarenplan voor graanonderzoek. Verslag over het vierde jaar 1957. (**Ten-year plan for cereal research. Report for the fourth year, 1957**), Nederlands Graan-Centrum, Wageningen 1957 : Pp. 136.

2307 *Dantuma, G. Verslag over kruisingsprogramma en klimaatresistentie-onderzoek. (Report on the crossing programme and investigations on climate resistance). (pp. 11–18).*

Wheat. Several winter varieties and selections displayed susceptibility to natural infection with yellow rust in spring but proved resistant later. A number of American spring wheats were resistant to the more important physiological races at both seedling and adult stages and also showed field resistance to brown rust. A combination of good winter hardiness, vigorous spring development and good ripening has been found in winter wheats of American and Russian origin. Among spring wheats, the best material was (1) productive selections from Minister x Peko and other crosses between spring and winter wheats, (2) crosses involving hardy Canadian spring wheats and (3) crosses for which Italian varieties were used as parents with the aim of obtaining early-ripening spring wheats. Sowing-time trials allowed wheats of the following types to be selected: (1) those with low cold requirements and early maturity, exemplified by various Italian winter wheats: (2) those with no cold requirement and very early ripening, such as Agrella, Mentana and Florence x Aurore; and (3) such wheats as Peko and Carpo, which show a definite response to vernalization and are midlate or late in ripening.

Oats. Varieties which did well in dry periods in sandy soils have been used as parents.

Barley. Spring and winter varieties resistant to *Rhynchosporium* have been found among American material. Selections from crosses involving *Hordeum spontaneum* var. *nigrum* have been subjected to back crossing. The varieties Vega, Stella and Halikko, which are tolerant of low pH, have been used in breeding spring barleys for sandy soils.

2308 *Belderok, B., Meppelink, E. K. & de Ruiter, D. Methodiek bakwaarde-onderzoek van kleine monsters tarwe.* (*Methodology of research on the baking quality of small samples of wheat*). (*pp. 19–36*).
Methods used in making baking tests, dough-ball tests and tests of water absorption and swelling capacity of the gluten, using micro-samples, are described and their results compared with those of standard baking tests.

2309 *Meppelink, E. K. Registratie van het bakwaardeniveau van de inlandse tarwe-oogst 1957.* (*Record of the level of baking quality of the Netherlands wheat harvest in 1957*). (*pp. 37–50*).
Details of regional and varietal differences in baking quality are presented for ten varieties.

2310 *van Dobben, W. H. Verslag van proefnemingen op het gebied van het fundamentele graanonderzoek.* (*Report on experiments in the field of fundamental cereal research*). (*pp. 81–102*).
A method of testing barley for tolerance of low pH is described. It involves growing the plants in pots together with oat plants at a low pH and measuring the depressive effect of the barley upon the oats. Data are given for ten varieties of which Vega, Stella, Halikko and Saxonia did best at a low pH. In developing material for sandy soils, this testing method is used; the F_3 of Halikko x Herta has shown promise in this respect.
Heat damage during flowering chiefly affects grain number in wheat, and chiefly grain weight, and hence quality, in spring barley. The difference in behaviour is related to the occurrence of several flowers per spikelet in wheat and of only one per spikelet in two-rowed barley, so that in the former a number of flowers per spikelet may be killed but the remainder will continue to develop without decrease in quality while in the latter each flower is damaged. Petkus rye, with two flowers per spikelet, behaves like barley, while oats behave like wheat.
In studies of photoperiodic behaviour, spring wheat and rye were both long-day plants and showed greater response to day length at 25° C. than at 15° C., while maize was a short-day plant and showed the greater photoperiodic response at 15° C. The Netherlands maize CB 1 x 3 had a higher optimum day length than Pioneer and was more nearly day neutral.

2311 *Zadoks, J. C. Het gele-roestonderzoek in 1957.* (*Investigations on yellow rust in 1957*). (*pp. 123–34*).
The most prevalent physiological types were groups 7x and 2x.

2312 Stations Fédérales d'Essais Agricoles, Lausanne. Rapport d'activité 1957. **(Federal Agricultural Research Stations, Lausanne. Report of activity, 1957).**
Landw. Jb. Schweiz. 1958 : **72** : 263–413.
In addition to the work mentioned below, trials of cereals, forage plants, root crops, fruit and vegetables are reported.
Wheat. Many new hybridizations were effected involving local and foreign varieties; a large number of F_1 hybrids of spring and winter wheats are also being studied. Trials are under way with F_2 and F_3 families of crosses between frost-resistant lines of *T. dicoccum* and *T. turgidum* and high-yielding varieties of *T. aestivum*. Some F_4 and F_6 hybrids from crosses between *T. timopheevi* and *T. aestivum* have shown good fertility and good resistance to fungous diseases. Some of the many hybrids between *Triticum* and *Secale* under observation have also shown good fertility. Plants combining the *T. aestivum* type of ear and the *pilosa* stem characters are being selected. Also crosses of *Triticum* with *Agropyron* and *Aegilops* are being studied. Attempts were made to induce mutations in the spring variety Lichti by X-ray treatment.
Rye. Studies continued on autotetraploid forms.
Maize. Many new hybrids are under observation.
Barley. Several tetraploid families are under investigation. Young ovules of tetraploid Riniken 52 are being investigated to find out the cause of the partial sterility. Mutations have been induced by X irradiation.

2313 Pal, B. P.
The progress of plant breeding in India.
Indian J. Genet. 1958 : **18** : 1–7.
The text is given of the presidential address delivered at the eighteenth annual general meeting of the Indian Society of Genetics and Plant Breeding held at Madras during January 1958. A short survey of progress already achieved, chiefly in cereal breeding, is followed by a consideration of outstanding problems, new developments and techniques, the practical application of the results of research, and planning and organization.

2314 Money-Kyrle, A. F.
Agricultural development and research in Turkey.
Publ. Fac. agric. Sci. Amer. Univ. Beirut 1957 : No. 4 : Pp. 202.

Chapter 6 on Agronomy includes information on breeding and variety testing, chiefly in cereals, sainfoin, cotton, flax, *Cannabis sativa*, tobacco and sesame.

2315 Walton, P. D.
Plant breeding in the central rainlands of the Sudan, 1951-6.
Emp. J. exp. Agric. 1959 : **27** : No. 105 : 79–85.

Cotton breeding in the Sudan has already been surveyed by R. L. Knight [XXIV, 3163]. The present article deals with work on the following crops at the Central Rainlands Research Station, Tozi, where investigations have been directed towards the development of a system of mechanized farming.

Maize. The demonstration, in 1954, of a marked response to N, P and Zn suggested that testing of introduced material might be usefully resumed. In general, the most successful varieties have been those intermediate in height and maturation time, most of the higher-yielding varieties being top crosses or double hybrids.

Sorghum. It has proved impossible to divide the collection of over 800 local and introduced accessions into groups on the basis of existing classifications, since many characters are either influenced by environmental factors or are associated in homologous series which can only be divided into arbitrary groups. Head type appears to be a character devoid of these disadvantages.

Harland's mass-pedigree system [cf. XX, 1012] has been applied with the aim of selecting dwarf, uniform and high-yielding strains from the mixed local varieties. Of the strains thus obtained, selected Wad umm Benein shows particular promise, growing 3–3½ ft. high with a well-extruded head and general similarity in appearance to the American dwarf combine types. Strains resistant to lodging as the result of the "dry-stem" character or apparent immunity from charcoal rot [*Sclerotium bataticola* (*Macrophomina phaseoli*)] have been isolated from local varieties.

Kenaf. Local material has been mass selected to obtain an unbranched variety producing its first flower about 5 ft. above the ground. The three uniform bulks developed flower at 5½, 5 and 5½ ft. respectively and are to undergo tests for the quality and uniformity of their fibre.

Sesame. Two groups of dehiscent varieties have been tested and used in crosses in the improvement of sesame for hand harvesting by existing native methods: early-flowering dwarf types and medium-flowering local varieties. Varieties in the former group have not given good yields but have proved valuable in breeding. The local varieties which have given the highest yields are Mafaza Light and Gideim. In an attempt to improve the local types, a dwarf, unbranched and early-flowering American variety, K10, with three capsules per axil and with short internodes and therefore high capsule number per unit length of stem, has been used as parent. The object of the crosses is to retain as far as possible the large-branched habit of the local parent while increasing capsule number per plant. Selection is being effected for shorter internodes, three capsules per axil and capsule size.

Lines carrying the gene for indehiscence discovered by Langham [XVII, 317] have been selected from a multiple cross introduced from the USA and crossed with local varieties. Although low in yield, they are free from other undesirable characters.

Sunflower. In view of the absence of suitable pollinating agents, Giant Russian has been subjected to selection for self fertility. Lines giving a mean percentage of self fertilization as high as 94% were isolated. The capacity for self fertilization appears to have a minor-gene basis of inheritance.

Groundnut. The Tozi collection was found to contain many strains suitable for mechanical harvesting. No breeding was therefore undertaken, work being confined to testing the yields of the more promising types and to intravarietal selection for yield.

2316 **Annual Report of the Agricultural Department of the Eastern Region of Nigeria.** 1956–57. Pp. 38.

In addition to work reported below, investigations on cassava, cacao, rubber, citrus fruits, groundnuts and several vegetables were carried out.

Maize. A final assessment of rust resistance in inbred lines derived from "West African Maize Research Unit progeny, 1860" was made.

Yam. Two trials to test the yielding ability of Chinese yam (*Dioscorea esculenta*) in relation to a range of local yams were carried out. In the first trial, Okumanu (*D. cayenensis*) and Anam (*D. rotundata*) were the highest yielders with the Chinese yam next, and in the second trial

Eko (*D. rotundata*) was the highest yielder with Chinese yam second.

Tomato. Imported American varieties proved unsatisfactory but a variety from Ghana was promising but inferior to the best all-round local variety, Dwarf Gem.

Cowpea. Trials have shown that New Era and Mauritius, two coloured varieties, give a higher yield than the local white varieties. A breeding programme is scheduled, involving the crossing of these two coloured varieties with Onitsha Small White in an attempt to produce a high-yielding cowpea of suitable palatability.

2317 Le Marchand, G.
Les centres d'essais locaux (C.E.L.) du nord du Kivu. (**The local testing centres north of Kivu**).
Bull. INÉAC 1958 : **1** : 303–21.

The organization of these centres, where varieties of important crops are tested, is briefly described. In the trials of cassava, Ntolili gave the highest yields but it is not so sweet or so resistant to mosaic as the local variety Gonga na butu. Potatoes were also tested; the results obtained so far are not conclusive but Sientje has done well near the equator and Star 2 was the best variety in regions between the first and second southern parallels. The six most promising French-bean varieties are also listed; the most productive of the pea varieties tested are Kyondo and D318. Kihusa, a local variety of groundnut, has not been surpassed by any élite selections. Of the cereals tested, E. Kisozi, a wheat variety, gave a promising performance and the barley Research did well under favourable conditions.

III Reunión Interamericana de Fitogenetistas, Fitopatólogos, Entomólogos y Edafólogos, Bogotá, D.E., Colombia, 20 de Junio a 1° de Julio de 1955. (**Third Inter-American Conference of Phytogeneticists, Phytopathologists, Entomologists and Edaphologists, Bogotá, DE, Colombia, 20 June to 1 July 1955**).
1958 : Pp. xvi + 459.

2318 *Wellhausen, E. J. El estado actual de los trabajos sobre el mejoramiento genético de las principales plantas básicas alimenticias, en la América Latina.* (*The present state of work on the genetical improvement of the main basic food crops in Latin America*). (*pp. 41–58*).

In this survey of Latin American breeding projects in maize, French bean, wheat and potato, the value of plant introductions and international cooperation is stressed. It is suggested however that for maize as much attention should be paid to soil improvement as to breeding, since many of the native varieties are capable of high yields on fertile soils. In referring to bean, the author emphasizes the danger, from the point of view of disease resistance, of concentrating on the development of homozygous lines; synthetics are regarded as more useful. Mention is made of the good progress achieved in Mexico in breeding composite wheat with resistance to a wide range of physiological races of rust. In Mexico, Peru and Colombia extensive work on blight resistance in potato is under way.

2319 *Bocanegra S., S. Mejoramiento del maíz en la Estación Experimental Agrícola de La Molina y sus resultados en la Costa Central del Perú.* (*Maize breeding at the Agricultural Experimental Station of La Molina and its results in the Costa Central of Peru*). (*pp. 83–84*).

The development of the hybrid La Molina 3 is described [cf. XXV, 278]. Three new lines, 7, 8 and 11, have been used in the production of double-cross hybrids.

2320 *Grant, U. J. & Peña V., B. Valor de la selección visual en el mejoramiento del maíz.* (*Value of visual selection in maize breeding*). (*pp. 91–92*).

Inbred families of Éto, Col. 2 and Nar. 330 were studied. In investigations on combining ability, visual selection was effective in Col. 2 but not in the other two varieties. Significant positive correlations in agronomic characters were found between the lines and their top crosses.

2321 *Grant, U. J., Roberts, L. M. & Smith, D. L. Aspectos del programa de mejoramiento del maíz en Colombia.* (*Aspects of the maize breeding programme in Colombia*). (*pp. 93–94*).

Current work includes: collection and testing of Colombian varieties; development of inbred lines; production of hybrids, synthetics and improved varieties; and the study of crosses involving male sterility, fasciation and other characters.

2322 *Grobman, A. Clasificación preliminar de los maíces peruanos.* (*Preliminary classification of Peruvian maizes*). (*pp. 95–96*).

Peruvian races are divided into three main groups: (1) those of the coastal region, comprising 13 varieties; (2) those of the Sierra, containing 9 varieties; and those of the eastern

slopes of the Andes and the Selva, including seven varieties.

2323 *Grobman, A. & Moreno, U. Número de nudos cromosómicos en maíces costeños peruanos.* (*Number of chromosome knobs in Peruvian coastal maizes*). (*p. 97*).

In maize varieties from the coastal region of Peru, the frequency distribution of chromosome knobs per chromosome complement was skewed towards a low frequency, the largest class being that with 2·01–3·00 knobs per complement.

2324 *Groszmann, A. Traslado de esterilidad citoplásmica masculina a líneas endocriadas de maíz, en el Brasil.* (*Transference of cytoplasmic male sterility to inbred maize lines in Brazil*). (*p. 98*).

Cytoplasmic male sterility was transferred from a hybrid from Texas to four flint and six dent inbreds. On being back crossed, the flint lines regained their fertility while the dent lines, with one exception, remained male sterile. It is thought that the flint lines probably differ from the Texan line in ancestry and that the exceptional dent line probably has some flint in its pedigree. It is suggested that cytoplasmically male-sterile lines may be useful in distinguishing between lines with different types of ancestry.

2325 *Groszmann, A. Resultados de primer ciclo de un programa de selección recíproca recurrente en maíz.* (*Results of the first cycle of a programme of reciprocal recurrent selection in maize*). (*pp. 99–100*).

Use of the method began in 1947 using the open-pollinated varieties Tuxpan and Catete. In 1951 the first cycle of selection in Catete x Tuxpan yielded the same as commercial double hybrids in one locality but less at eight other stations. Because of difficulties in preventing contamination of Tuxpan material by Catete, the method has been discontinued.

2326 *Groszmann, A. Métodos para iniciar el programa de mejoramiento donde aún no se dispone de líneas autofecundadas.* (*Methods for the initiation of a breeding programme in areas where inbred lines are not yet available*). (*pp. 101–02*).

In one of the six ecological zones into which Brazil is divided for purposes of maize breeding, commercial production of double-cross hybrids is under way. In the other zones the best local varieties are collected, hybridized and tested against their parents and against the two best hybrids of the first-mentioned zone. Two local varieties have shown promise for the production of intervarietal hybrids and are also being inbred for the later production of hybrid maize.

2327 *Gutiérrez, M. & Soria V., J. Eficiencia del método de selección en consanguinidad por cruzamientos dirigidos, en el mejoramiento del rendimiento del maíz.* (*Efficiency of the method of selection of consanguineous lines for directed crosses in improving the yield of maize*). (*p. 103*).

The above method [cf. XXI, 227] has been evaluated in work carried out at Turrialba, Costa Rica.

2328 *Obregón, P. Utilización de líneas introducidas en los actuales trabajos de mejoramiento del maíz en Venezuela.* (*Use of introduced lines in current maize-breeding work in Venezuela*). (*p. 104*).

In combinations with the S_2 of Venezuela 1, the yellow line 483 from Brazil has yielded 30% more than the control Venezuela 1 and in combinations with Chuco Amarillo [Yellow Chuco] and Cuban Yellow Dent up to 47% more than the control. Hybrids involving Mexican lines and Sicarigua have outyielded Sicarigua and Venezuela 3 by 10%.

2329 *Patiño, V. M., Daza, P. E. & Roberts, L. M. Ensayo de energía germinativa y poder germinativo comparativos en distintos tipos de granos de maíces colombianos.* (*Test of the comparative germination energy and germination power in distinct types of grain in Colombian maizes*). (*pp. 105–06*).

In tests of 27 varieties of the pop-corn, hard and floury-grained types, no differences in germination were detected among the three types.

2330 *Roberts, L. M.* et al. *Clasificación de las razas de maíz en Colombia.* (*Classification of the races of maize in Colombia*). (*pp. 107–08*).

A collection of 1530 samples fell into 17 races, five of them occurring in cool climatic regions and the remainder in medium or hot localities. A later and more detailed report of this work has already been summarized [1497].

2331 *Roberts, L. M., Grant, U. J., Chavarriaga M., E. & Torregroza C., M. Resultados preliminares sobre producción de dos variedades sintéticas.* (*Preliminary results on the production of two synthetic varieties*). (*pp. 109–10*).

The method used in producing synthetics of the yellow variety Eto and the white variety Colombia 2 at Bogotá, Colombia, is described. An improvement in yield over the original varieties was obtained when the single crosses from the selected lines were combined to form

double crosses but a decrease occurred in later generations.

2332 *Sarria, D., Ramirez, M. A. & Astralaga, R. Influencia de la selección en S_0 en maíz.* (*Influence of selection in the S_0 in maize*). (*pp. 111–12*).

Studies of S_0 and S_1 plants of the varieties Eto, Blanco común [Common White] and Venezuela 1 showed that: inbreeding depression occurs and is more or less constant in the varieties studied; the S_1 lines retain many of the characteristics of the S_0 plants, for which reason stringent selection in open-pollinated plants intended for inbreeding is recommended; a high positive correlation exists between the height of insertion of the ear and the distance between the ear and the base of the tassel; and no correlations obtain between these characters and the number of leaves above the ear and the angle formed by the leaves and the stem.

2333 *Varela A., J. D., Grant, U. J. & Yepes Y., E. Estudio comparativo sobre las características de la mazorca en tres variedades de maíz de clima frío.* (*Comparative study of ear characteristics in three maize varieties from a cool climate*). (*pp. 113–14*).

A table of correlation coefficients and *t* values for various combinations of grain and ear characters is given for the varieties Sabanero Cristalino blanco [Savanna White Flint], Sabanero Harinoso amarillo [Savanna Yellow Floury] and Cabuya Cristalino amarillo [Cabuya Yellow Flint].

2334 *Pinto, G. V. Descripción, intercambio y utilización del plasma germinal del maíz.* (*Description, exchange and utilization of germ plasm of maize*). (*pp. 115–17*).

Systematic collection of local maize types is in progress in both North and South America, under the auspices of the National Research Council and the National Academy of Sciences in the USA working in collaboration with the Centres of Indigenous Maize in Mexico, Colombia and Brazil. Descriptions of the collections are being made [cf. XXIII, 1158] and the material is available for exchange and breeding.

2335 *Pinto, G. V. Comportamiento de líneas colombianas de maíz en el Brasil.* (*Performance of Colombian maize lines in Brazil*). (*pp. 118–19*).

The Colombian line Urr 5 x Ven. 1 has shown high combining ability in crosses with ten lines from the maize Cateto. From data on the single hybrids obtained from all combinations of these 11 lines, predictions of the yields of double hybrids have been made; 57 should outyield H–3531 by at least 20% and of these, 47 include Urr 5 x Ven. 1 in their parentage. Other material which has done well includes: lines L1 and Bra & P1; the hybrids (Col. 1–60 x Des 2–41) (278–1–1 x 483) and (L1 x L21)(278–1–2 x 483), yielding 5032 and 5672 kg./ha., respectively, compared with 3378 kg./ha. for the control Minas 2; the S_3 line L2856–2 from (L1 x Col. 1–160)(483 x 606); and other S_3 lines from double hybrids.

2336 *Yepes, E. & Grant, U. J. Maíz de tierra fría. Ensayos comparativos sobre precocidad y rendimiento en Tibaitatá.* (*Maize for cool districts. Comparative tests of earliness and yield in Tibaitatá*). (*pp. 120–21*).

The early variety Rocamex V7 was not well adapted to the above region but its hybrid with the control variety Bco. Rubí outyielded both parents and was intermediate in earliness. Boy. 400 had a growth period of 118 days, compared with 150 in the control, but was equal in yield and has proved useful in breeding.

2337 *Yepes Y., E., Astralaga de R., R., Cassalet D., C., Torregroza, M. & Díaz B., E. La colección de variedades extranjeras en Colombia y su utilidad en los programas de mejoramiento.* (*The collection of foreign varieties in Colombia and their use in breeding programmes*). (*pp. 122–23*).

Of 3669 introduced maizes maintained in the collection in Colombia, 3402 are from Chile, Bolivia, Ecuador, Peru and Venezuela and the remaining 267 from other countries. Several promising selections have been made and are being studied at the various breeding stations in Colombia.

2338 *Borlaug, N. E. Factores que influyen en la elección de los métodos de mejora genética del trigo.* (*Factors affecting the choice of genetical breeding methods for wheat*). (*pp. 126–30*).

Factors to be taken into account in any breeding programme include: the present state of cultivation in the region concerned; the availability of trained personnel; and the physical and financial limitations of the station. Wide knowledge of the climatic and edaphic conditions of the region, cultural practices, the problems of diseases and pests and the advantages and drawbacks of the popular varieties is needed. To discover desirable parents, a wide range of introduced material should be studied. The desirability of reviewing breeding objectives

from time to time in relation to changing cultural practices is also noted.

2339 *Kugler, W. F. La acción privada en la creación y difusión de nuevas variedades mejoradas de trigo.* (*Private work in the creation and distribution of new improved wheat varieties*). (*pp. 133–35*).
Much of the improvement in wheat in Argentina over the past 30 years has been effected by private breeders. The state breeding stations are regarded as more suited than the private breeders to the development of fundamental research.

2340 *Reyes N., R. & Peña Acosta, L. Fuentes de resistencia a las royas de trigo en Colombia.* (*Sources of resistance to wheat rusts in Colombia*). (*pp. 139–40*).
The reactions of nine varieties to *Puccinia graminis* var. *tritici* in 1951 and 1954 are given and a table is presented of varieties used in breeding for resistance to this rust, to *P. triticina* or to *P. glumarum.*

2341 *Silva, A. R. de. Forma de encarar los estudios de las razas fisiológicas para que sus resultados sean de utilidad máxima para los fitogenetistas.* (*Method of tackling studies of physiological races so that the results are of maximum use to plant geneticists*). (*pp. 141–43*).
With special reference to stem rust of wheat, it is suggested that, in view of the diversity of physiological races resulting partly from geographical isolation and partly from the different host varieties cultivated in different regions, and since the introduction of a new resistant variety may eliminate old pathogenic races but encourage the multiplication of others, the differential varieties used in breeding should include the sources of resistance used in a given region and also the cultivated varieties of the region. This would necessitate a large number of differentials, and it is therefore further suggested that crosses among differential varieties should be carried out with the aim of combining resistance in the fewest possible varieties.

2342 *Valbuena T., L. A. Líneas isogenéticas.* (*Isogenic lines*). (*p. 144*).
Isogenic F_6 lines of wheat differing only in the presence or absence of the factor for resistance to *Puccinia glumarum* have been developed at Bogotá, Colombia. Segregation occurs in some of the resistant lines and those which fail to segregate are discarded.

2343 *Villanueva Novoa, R. Los híbridos de trigo de la Estación Experimental Agrícola de La Molina y su valor para la agricultura peruana.* (*The wheat hybrids of the Agricultural Experimental Station of La Molina and their value in Peruvian agriculture*). (*pp. 145–47*).
From tests of 99 hybrid lines in various areas in Peru, it is concluded that for altitudes of 0–1500 m. resistance to black and brown rusts and moderate resistance to yellow rust are required, for 1500–3000 m., resistance to black and yellow rusts with moderate resistance to brown rust and for 3000 m. and above, resistance to yellow and brown rusts with moderate black-rust resistance. The hybrid material studied includes lines resistant to black rust alone, resistant to black and yellow rusts combined and resistant to black and brown rusts. Five varieties recommended for different altitudes are listed.

2344 *Villanueva Novoa, R. Herencia de la reacción a "oidium", roya de la hoja, roya del tallo y de otros caracteres en el cruce de los trigos "María Escobar" e "Industrial Argentino".* (*Inheritance of reaction to mildew, leaf rust, stem rust and other characters in the cross of the wheats María Escobar and Industrial Argentino*). (*pp. 148–51*).
[Cf. XXVI, 1185].

2345 *Zapata Balcazar, M. & García, L. A. Variedades sintéticas de trigo para Colombia.* (*Synthetic varieties of wheat for Colombia*). (*pp. 152–54*).
The stages involved in the production of a synthetic variety using Menkemen as the basic variety and Mayo 54 and Frontana as sources of resistance to *Puccinia graminis* and *P. glumarum* respectively are described. Other varieties being used in the production of synthetics are Selkirk, Chinese 166 and Bonza sib.

2346 *Sierra F., J. A. & Arango A., R. Evaluación de la colección mundial de cebadas en Colombia.* (*Evaluation of the world collection of barleys in Colombia*). (*pp. 157–58*).
The 6452 lines forming the world collection in Colombia have been evaluated for resistance to various diseases and to lodging and for spring and winter habit. The numbers of lines showing the different characters are indicated and some of the best varieties listed. Egyptian material included lines resistant to breakage of the rachis and some early lines but also showed a

high percentage of ergot infection. Varieties from China, Korea, Nepal and Bhutan had naked grains and were generally susceptible to *Puccinia anomala*. Barleys of the Coast type were resistant to shattering and showed severe attack by stem rust. The Manchuria group, resistant to *P. anomala* in the USA, proved susceptible in Colombia and were also susceptible to shattering. *Hordeum deficiens*, belonging to the Abyssinia group, was generally resistant to lodging. Some 130 lines have been used in crosses with local material.

2347 *Cenoz, H. P. Fuentes de resistencia con respecto a las razas fisiológicas de los principales parásitos que afectan los cereales. (Sources of resistance with respect to physiological races of the principal parasites affecting cereals). (pp. 159–60).*

The desirability of cooperation and exchange of material between countries in testing and breeding cereals for disease resistance is stressed. It is noted that tests of the extensive USDA collection, conducted in different countries in North and South America, Europe, Africa and Asia have allowed numerous sources of rust resistance in wheat and oats to be found.

2348 *Painter, R. H. Las posibilidades de un estudio de resistencia a los insectos en plantas cultivadas, latinoamericanas. (Possibilities in the study of insect resistance in cultivated plants of Latin America). (pp. 161–63).*

It is pointed out that the availability of resistant varieties is particularly important for the small farmer who lacks facilities for treating his crops with insecticides and it is suggested that breeders should take great care that any new varieties released should be at least as resistant to the various pests as the older varieties they are replacing. It is also regarded as desirable that maize, potato and other crops should be tested for resistance to pests in their areas of origin.

2349 *Bravo A., R. Efectividad de lindane como inductor de poliploidismo en centeno. (The efficiency of lindane as an agent for inducing polyploidy in rye). (pp. 164–65).*

[Cf. XXVII, 2872].

2350 *Rojas M., E. Hacia la creación de tipos de girasol resistentes a la roya. (Towards the creation of sunflower types resistant to rust). (pp. 166–67).*

[Cf. XXVI, 1636–37 and 2734].

2351 *Bocanegra S., S. Variedad mejorada de fríjol Canario para la Costa Central del Perú. (An improved variety of the Canario bean for the central coastal area of Peru). (pp. 168–69).*

[Cf. XXVII, 4601].

2352 *Duarte Torres, R. Métodos de mejoramiento del fríjol. (Methods of bean breeding). (pp. 170–71).*

Methods used at the Bureau of Special Investigations, Bogotá, include (1) individual plant selection in commercial varieties, by means of which a high degree of rust resistance has been attained in some lines, (2) simple crosses, (3) back crossing and (4) multiple crosses.

2353 *Fernández B., L. Descripción, intercambio y aprovechamiento del plasma germinal. (Description, exchange and utilization of germ plasm). (pp. 172–73).*

The collection of French beans in Colombia contains 2020 varieties from North, Central and South America, Europe and Asia. As much variation in morphological characters, disease resistance and colour and quality of the seed occurs within Colombian material as between Colombian and introduced varieties. The material in the collection is being used in breeding for yield, disease resistance and earliness.

2354 *Gartner N., A. Fríjol: principales objetivos del mejoramiento. (French bean: main breeding objectives). (pp. 174–75).*

In order to increase yields in Colombia, the chief requirement is resistance to bacterial and fungal diseases. Some foreign varieties, high in quality, give high yields but are not suitable for Colombia because the beans are unacceptable in appearance, the habit of growth is not suited to mechanization and their growth period is too long, being 110–160 days.

2355 *Estrada R., N. Los híbridos interespecíficos de papa, una solución al problema del mejoramiento para los países andinos. (Interspecific potato hybrids, a solution of the problem of breeding for the Andean countries). (pp. 176–77).*

Lines yielding 20–60% more than local varieties have been obtained from crosses involving *Solanum tuberosum* ssp. *andigenum* as pollen parent and *S. tuberosum* ssp. *chileanum* 'Branca cascuda' [Thick-skinned White] and 'Madison' as female parents. Many of the hybrids show resistance to late blight and some are good in quality and earlier than native varieties.

2356 *Estrada R., N. Mejoramiento de la papa en Colombia, para la obtención de variedades resistentes a la "gota"* (P. infestans). [*Breeding the potato in Colombia with the aim of obtaining varieties resistant to blight* (Phytophthora infestans)]. (*pp. 178–79*).

In breeding for blight resistance, hybridization of *Solanum demissum* and *S. malinchense* with varieties of *S. andigenum* has been effected. Hybrids involving *S. demissum* and *S. andigenum* have been back crossed twice to the former parent. Hybrids have also been obtained between *S. tuberosum* ssp. *chileanum* and *S. andigenum*.

2357 *Estrada R., N. Mejoramiento de la papa para resistencia a heladas.* (*Breeding potato for frost resistance*). (*pp. 180–81*).

At the Usme Experimental Station, Colombia, a high degree of resistance to frosts occurring in the dry season in January and February has been found in *Solanum demissum, S. acaule, S. juzepczukii* and some varieties of *S. ajanhuiri* and *S. curtilobum*. The crosses *S. curtilobum* ($2n = 60$) x *S. andigenum* ($2n = 48$) and *S. ajanhuiri* ($2n = 24$) x *S. rybinii* ($2n = 24$) were successful and resistant hybrids involving *S. curtilobum, S. acaule, S. neohawkesii* and *S. abbotianum* have been obtained from Peru. Most of the parents providing frost resistance also confer susceptibility to *Phytophthora infestans*.

2358 *Ragonese, A. Métodos de mejoramiento e intercambio y aprovechamiento de plasma germinal.* (*Methods of breeding and exchange and utilization of germ plasm*). (*pp. 187–89*).

The importance of establishing collections of germ plasm in breeding forage crops is stressed and the need for greater cooperation between countries is pointed out. It is suggested that the different Latin American countries should be responsible for collection in different climatic regions and that within each region each species or group of related species should be the responsibility of one breeding station.

2359 *Stakman, E. C. Relaciones entre la reacción de campo y la de invernadero para los estudios de enfermedades vegetales.* (*Relations between field and greenhouse reaction in studies of plant diseases*). (*pp. 200–01*).

In field tests for resistance, varietal behaviour is affected by many factors and exact data should be obtained on meteorological conditions, soil and physiological races of the pathogen. In greenhouse tests, detailed studies of the effects of individual controlled factors such as temperature are possible, and different races and combinations of races should be tested under different conditions. Field and greenhouse tests are both necessary and should complement each other.

2360 *Skiles, R. L., Cardona A., C. & Barros N., O. Reacción de líneas de maíz a pudriciones del tallo con* Fusarium *y* Diplodia. (*Reaction of maize lines to* Fusarium *and* Diplodia *stalk rots*). (*pp. 203–04*).

In inoculation tests with a mixture of the two fungi, lines from Colombia 2, Eto, Bra.2, Bra.7PL, Cateto 483, PTR10, PTR1, Colombia 1 and the cross Ven. 1 x Mex. 53–659–3 all showed a marked tendency towards resistance.

2361 *Paris Navarro, R. El enanismo del trigo y la cebada en Nariño* (*Colombia*). (*Dwarfing of wheat and barley in Nariño, Colombia*). (*pp. 206–07*).

Dwarfing of unknown origin has been observed among wheats and barleys in Colombia. Wheat varieties showing frequent attack and others which always show normal development are listed. The latter include Froco, 150, Thatcher, Klein Orgullo [Klein Pride], Falcones, Pielroja [Redskin], Chin. P47–614, Cal.–Kenya S11–1, Tim. x Henry, Thatcher x Sta. Catalina, Red Egyptian x Mida and Ola-Frontana.

2362 *Rojas Mendoza, E. & Swanson, A. F. El trigo y la roya negra en el Perú.* (*Wheat and black rust in Peru*). (*pp. 209–10*).

[Cf. XXVI, 1196].

2363 *Volosky de Hernández, D. Relación del desarrollo de* Puccinia graminis tritici *en campo e invernadero.* (*Relation between the development of* P. graminis tritici *in the field and in the greenhouse*). (*pp. 211–12*).

Field data on the stem-rust reaction of 749 wheats grown in the Paine International Rust Nursery at Santiago, Chile, were compared with data from greenhouse tests in which the varieties were inoculated with race 15B. The correlation between the two sets of data was $r = 0{\cdot}310$ and was highly significant. Of 197 lines which were immune or almost immune in the greenhouse, 169 were also immune in the field.

2364 *Volosky de Hernández, D. Comportamiento de líneas y variedades de trigo a la "caries o carbon hediondo".* (*Behaviour of wheat lines and varieties towards bunt or stinking smut*). (*pp. 213–14*).

[Cf. XXVIII, 1549].

2365 *Volosky de Hernández, D. Correlación entre trabajos de campo e invernadero con* Puccinia glumarum. (*Correlation between field and greenhouse results with* P. glumarum). (*p. 215*).

In tests of 540 [? wheat] lines, conducted in Chile, a significant correlation of $r = 0{\cdot}564$ was found between field reaction to natural infection and greenhouse reaction to inoculation with a mixture of cultures.

2366 *Volosky de Hernández, D. Comportamiento de variedades y líneas de trigo al* Puccinia glumarum. (*Behaviour of wheat varieties and lines towards* P. glumarum). (*pp. 216–17*).

Fifteen lines from the crosses Kenya x Lincoyán, Premier x Sinvalocho, Thatcher x Lincoyán, Sta. Catalina x Lincoyán and Thatcher x Sta. Catalina were resistant, showing 0–5% infection in the rust nursery at Santiago, Chile, in 1952. Eight further crosses, comprising 105 lines, were semiresistant (5·1–10% infection) and 15 varieties were resistant. In the last group, Frontana, H–194–11 Row 2210 and Kenya showed 0% infection.

2367 *Volosky de Hernández, D. & Caglevic D., M. Mal del pie en trigo.* (*Foot rot in wheat*). (*pp. 218–19*).

Among numerous varieties tested in various localities in Chile during 1952–54, none was resistant to foot rot caused by *Ophiobolus graminis* and *Alternaria* spp.

2368 *Skiles, R. L. Problemas patológicos y mejoramiento del fríjol en Colombia.* (*Problems of pathology and breeding in French bean in Colombia*). (*pp. 220–21*).

Since little equipment is at present available in Colombia for spraying against diseases, much attention is being given to crossing susceptible native varieties with resistant material. The work has two phases: first, the development of varieties for limited areas from local material which is susceptible to only one disease within such an area, and second, the production of varieties with a greater range of resistance suitable for larger areas.

2369 *Albornoz P., G. & Casseres, E. H. Rendimiento y evaluación de resistencia a infección natural de* P. infestans *de* 10 *clones y* 7 *variedades de papas, en Costa Rica.* (*Yield and the evaluation of resistance to natural infection by* Phytophthora infestans *in* 10 *clones and* 7 *varieties of potato in Costa Rica*). (*pp. 228–29*).

Among ten promising clones, introduced from Cornell University and Pennsylvania State University and compared with seven commercial varieties in Costa Rica in 1954, HIQ–1 and HLT–6 gave the highest yields and were highly resistant to late blight under conditions of severe attack and HDY–8 and 3VW–9 were slightly less resistant; these clones carry the resistance genes R_1 R_2. Clones SVW–7, HJM–1 and DDD–14 and several varieties, all carrying R_1, were susceptible except where infection was slight, in areas above 2000 m.

2370 *LeBeau, F. J. Estudios sobre el tizón tardío* (Phytophthora infestans *de Bary*) *en Guatemala.* [*Studies on late blight* (Ph. infestans *de Bary*) *in Guatemala*]. (*pp. 231–32*).

In 1954 a new race or races appeared in Guatemala to which varieties resistant to the common race by virtue of simple dominant factors for resistance proved susceptible. Among a collection of 23 native varieties only two gave satisfactory yields under the severe blight conditions of 1954; these varieties appear to carry a number of minor genes determining resistance.

2371 *Nolla, J. A. B. El mildiú de la patata y el tomate en Puerto Rico.* (*Blight of potato and tomato in Puerto Rico*). (*pp. 235–36*).

In tests conducted in 1954 and 1955, the potato varieties Essex, 3AB–2 and PI201403, carrying the respective resistance genes R_1, R_2 and R_3, all succumbed to attack by *Phytophthora infestans* while DXD–3, carrying R_4, suffered little, showing that a race distinct from the common race in the USA is present in Puerto Rico. Among tomatoes tested at the same time, including some which had shown resistance in Florida, none was resistant.

2372 *Thurston, D. Razas de la gota de la papa* (Phytophthora infestans) *en Colombia.* [*Races of potato blight* (Ph. infestans) *in Colombia*]. (*p. 239*).

According to the international system of nomenclature, the most common race of blight in Colombia appears to be race 0 or 1; races 4, 1,4 and 1,3,4 also occur. The clones 835a(4), Kennebec, Harford, Essex and Chenango are known to be susceptible to race 1 and resistant to race 0, but the first three of these are resistant to the common Colombian race while the last two are susceptible.

2373 *Orellana, R. & Aguirre, L. La patogenicidad de formas mutantes de* Colletotrichum *de cacao.* (*The pathogenicity of mutant forms of* Colletotrichum *of cacao*). (*pp. 247–48*).

At Turrialba, Costa Rica, single-spore cultures of *Colletotrichum gloeosporioides* isolated from

cacao leaves infected with anthracnose gave two cultural types, A and B. Further culture of type A gave rise to two mutant forms designated A–1 and A–2. On leaves of nonhardened clonal seedlings A–2 was the most pathogenic, A the least and A–1 intermediate, the symptoms being different from those usually caused by anthracnose. Similar reactions to A and A–1 were obtained on cuttings of clone U–F668 while A–2 gave uniformly extended lesions.

2374 *Grobman, A. & Pretell, J. Efecto del factor suelo sobre la expresión de la esterilidad masculina citoplásmica en maíz.* (*Effect of the soil factor upon the expression of cytoplasmic male sterility in maize*). (*p. 398*).

In tests conducted in Peru, in which F_1 seed from a cross between the cytoplasmically male-sterile form Texas 203MS x 61M and the local open-pollinated variety Amarillo LM [Yellow LM] was sown in plots with different levels of nitrogen, pollen production was greater in plots with a low C/N ratio than in those with a high.

2375 *Smith, D. L. & Chamorro Mera, R. Óptimo tamaño de parcela para ensayos de rendimiento en maíz.* (*Optimum plot size for yield trials of maize*). (*p. 411*).

In the analysis of a yield trial laid out in a simple 7 x 7 lattice design in four replicates and with four different plot sizes designated 2 x 10, 2 x 8, 2 x 6 and 2 x 4, a highly significant *F* value was obtained and the coefficients of variation were 9·0–9·4% for the first three plot sizes and 10% for the last, indicating that any one of these sizes may be used. The chief disadvantage of the smaller plots, which are useful where land available for trials is limited, is the greater risk of loss of material from the stands, this loss being of the order of 2–8% of the total population.

2376 *Buller, R. E. & Gonzalez, M. H. Comportamiento de variedades de alfalfa en el valle de México.* (*Performance of lucerne varieties in the Valley of Mexico*). (*p. 420*).

[Cf. XXVI, 1374 and XXVII, 3074].

2377 Shelby, T. O.
1957 performance trials of field crop varieties. Data for 1957 with summaries of results from previous years.
Bull. Tenn. agric. Exp. Sta. 1958 : No. 278 : Pp. 27.

Data are given on the performance of varieties of the above crops in Tennessee in 1957, with summaries of results from previous years.

2378 **Progress and research.**
68th Annual Report of the New Mexico Agricultural Experiment Station for the Fiscal year ended June 30, 1957 (1958) : Pp. 66.

Results of breeding work in wheat, barley, maize, sorghums, forage grasses, legumes, sugar beet and a number of fruits and vegetables are briefly reported.

Oats. Fultex proved to be the highest yielder. It is resistant to lodging, uniform in height and quality of grain, and matures early. It is therefore noted as the most adaptable spring variety for the Middle Rio Grande area.

Lucerne. New Mexico 16, a synthetic variety that has a considerable amount of resistance to *Therioaphis maculata*, has been released. Only progenies of mother plants originating from New Mexico 16 and Lahontan had resistance to this aphid.

Cotton. Results from the second generation of various crosses inoculated with *Xanthomonas malvacearum* indicated that within the resistant strains there appeared to be three or four different dominant genes for resistance. An attempt was made to produce bacterial-blight resistant lines from the susceptible lines 81, 216 and 8373 by the use of X rays. Testing of strains resistant to *Verticillium* wilt has shown that four of these strains equalled Acala 1517C in yield and spinning qualities. In preliminary strain tests, one strain was outstanding for fibre and spinning properties and also had satisfactory agronomic characters.

Chilli. Selection and testing within the Rio Grande variety have continued. New strains of this variety seemed particularly prone to a disease, tentatively identified as spotted wilt virus, but possibly due to hereditary factors which interact with seasonal and cultural factors to produce the diseased condition. Sardia A has proved to be the most dependable strain for most cultural conditions.

Onion. Strains of White Grano are being developed to combine high yield, resistance to bolting and uniformity in size, shape and colour. The new S–1 strain of White Grano outyielded several local strains of White Grano and compared favourably with Granex hybrids. Lines of White Grano were selected for superior combining ability as parents of white hybrids, and progenies of Granex back crossed to Grano 502 were selected for inbreeding and back crossing.

Pinto Bean. Two new promising strains have proved resistant to the New Mexico rust races,

to common bean mosaic and to curly top but are susceptible to *Xanthomonas phaseoli.*

2379 **Ninth Annual Report of the Commonwealth Scientific and Industrial Research Organization of the Parliament of the Commonwealth of Australia for the year 1956-57** : Pp. 179.

Varietal trials of sorghum, millets, soya bean and vegetable oil crops have continued. The Rio and Palmetto varieties of sesame from the USA and some dwarf types of castor beans from Hungary have proved superior to oil-seed varieties previously tested.

Maize. Back-cross progenies have been obtained by using autotetraploids, "to estimate recombination frequencies in one segment in diploid and haploid male gametes and in diploid female gametes of two heterozygotes".

Grasses. As part of the pasture improvement programme, flowering date, winter growth, summer dormancy and the occurrence of autumn flowering are being studied in *Phalaris* species. *Ph. tuberosa* x *Ph. minor* is being crossed with a range of material so as to produce a short-lived hybrid perennial. The usefulness of *Ph. daviesii,* a hybrid susceptible to cold, wet conditions, may be increased by new strains which are now available. Fifteen *Danthonia* interspecific combinations were sufficiently compatible to hybridize and produce F_1 plants. All the hybrids had low fertility, especially in crosses between diploids. Different, apparently autopolyploid, chromosome races have been found in *Themeda australis.* An attempt is being made to produce awnless *Hordeum bulbosum* by treating *H. vulgare* with colchicine and crossing the resulting tetraploid line with normal *H. bulbosum.* The breeding of a nonshedding strain of *Ehrharta calycina* by means of the polycross method is continuing. The breeding systems and strain variations in *Setaria sphacelata* and *Chloris gayana* are being investigated. These species are self incompatible and normally cross pollinating. Further work on apomixis in *Paspalum* and *Panicum* has indicated a degree of fertility in some species.

An examination of seedlings of *Sorghum* species, chiefly *S. almum,* revealed a few plants low enough in cyanogenetic glycosides to be used in breeding for low toxicity.

Medicago. Plants from ten strains and 44 F_1 lucerne hybrids varied in the ratio winter/summer growth rate. Hairy Peruvian and to a lesser extent Hunter River, Provence and an Australian selection showed high combining ability for this character. Winter production can apparently be much improved. The incorporation of the creeping-rooted characteristic into Australian strains is being attempted by back crossing F_1 hybrids to Hunter River and to creeping-rooted strains.

Lines of *M. tribuloides* are being developed which are isogenic except for the spiny character, in order to provide material for a study of natural selection. The spines are straight and are therefore less troublesome in wool than those of other *Medicago* species.

Other leguminous forage plants. The value of *Trifolium* species to supplement the use of subterranean clover is being investigated. Of these *T. clypeatum, T. spumosum* and *T. cherlei* compare favourably with subterranean clover in productivity and seed production. There has been difficulty in obtaining effective nodulation which has led to poor growth in many introduced legumes. New strains of subterranean clover are being bred to incorporate desirable characteristics into new strains to extend the geographical or agronomic range. Subspeciation appears to have occurred independently in different areas. The majority of Australian strains are moderately fertile when hybridized with Tallarook. Time of flowering is strongly inherited "with practically no genetic interactions". Strains from cool and dry areas exhibit a high degree of dormancy. Seed size influences plant size but growth rate is not strictly proportional to seed size, plants from small seeds growing relatively more quickly. The vernalization requirements, which vary greatly, of 50 different strains are being examined.

In Queensland, the genera *Desmodium* and *Indigofera* include many of the more promising species of pasture legumes. A study of the available strains of *I. endecaphylla* showed variation in content of total aliphatic nitrocompounds between but not within strains. A number of crosses have been made within the species. Interspecific crosses between *Indigofera* species have not been successful. Seed of *I. endecaphylla* has been treated with X rays and thermal neutrons with the object of obtaining a nontoxic mutant. The breeding system and intrastrain variation in *Leucaena glauca* have been studied. Self pollination results in a high degree of uniformity within strains.

"Because anthesis occurs in the closed bud of *Phaseolus lathyroides* at the beginning of bud expansion, the species is closely self-pollinating"; there appear to be no variants. Crosses between other *Phaseolus* species and *Ph. lathyroides* are

being attempted. The characters sought are perenniality, frost tolerance, nematode resistance, resistance to *Phaseolus* virus 2 and grain yield.

Tobacco. Breeding for resistance to blue mould (*Peronospora tabacina*) has continued. Hybrids have been obtained and several back crosses are showing promise. So far no resistant mutants have been produced by radiation or chemical mutagens. Comparison of the sporulation of *P. tabacina* on different tobacco varieties indicates that sporulation rate is a varietal characteristic.

2380 Nohe, E.
Die Neuzüchtung. (**Breeding new varieties**).
Saatgutwirtschaft 1959 : **11** : No. 2 : Samenfachmann : No. 12 : 92–96.

Procedures for breeding new varieties of cross-pollinated and self-pollinated plants are outlined.

Proceedings of the Fifth Meeting of the Israel Genetics Society.
Bull. Res. Counc. Israel : Sect. D : 1958 : **6D** : 260–62.

2381 *Atsmon, D. Germination inhibition in castor beans.* (*p. 260*).

Slow, disuniform germination of the variety Afruri is associated with (1) early and extensive development of sclerenchyma in the capsule wall and (2) extremely small seeds. A single dominant gene is responsible for (1). F_1 seeds from crosses of Afruri with a normal variety showed reciprocal differences in germination rate, those obtained with the normal variety as ♀ being faster in germination. The maternal tissues therefore affect germinability. The genotype of the ♂ parent also influenced germinability, although to a lesser degree. "This component of germinability which is influenced by the genetic make-up of the seed itself, is probably under multi-factorial control." Inheritance of seed size appeared to be quantitatively inherited. Seed size is also affected by (1), which tends to restrict seed development.

2382 *Stein, H. An analysis of a case of hybrid vigour in the castor bean plant.* (*pp. 260–61*).

Selfing for 6–7 generations at the Weizmann Institute of Science, Rehovot, has not led to inbreeding depression. The F_1 hybrid between the lines Pure Red and Pure Green showed a marked increase in yield over the higher-yielding parent, together with considerable increase in vegetative vigour. The changes in the following components of yield were examined: (1) number of seeds per raceme, (2) number of racemes per plant and (3) 100-seed weight. Only in (1) did the hybrid exceed the parent with the higher value. The superiority of 58% in this respect was probably an expression of the increase in vegetative vigour. In the case of (2) the hybrid came very close to the parental arithmetic mean while with regard to (3) it approached the parental geometric mean. The hybrid exceeded both parents, however, in the product of (2) x (3). Although in the hybrid studied the product effect was accompanied by physiological heterosis, it should prove feasible to find parental combinations giving progenies which show only the product effect and are therefore more efficient producers.

2383 *Jacob, K. M. Pachytene studies in the castor oil plant.* (*p. 261*).

[Cf. 1854].

2384 *Ashri, A. Interspecific relationships in the genus* Carthamus. (*p. 261*).

[Cf. XXVIII, 1302].

2385 *Galun, E. Inheritance of the sex forms in* Cucumis sativus. (*pp. 261–62*).

Previous investigations had indicated that the flowering pattern in cucumber may be divided into three phases, (1) male, (2) mixed and (3) female. In (2) both staminate and pistillate flowers are produced. In monecious plants only (1) and (2) are of common occurrence while in gynecious plants only (3) and occasionally (2) occur. Crosses between monecious and gynecious plants gave rise to progeny in which the number of gynecious individuals was always lower than was expected on the basis of the hypothesis of one dominant gene for gynecy. This result was attributable to the presence of some gynecious plants which had a longer phase (2) than usual and therefore resembled monecious segregates. Furthermore, it was found that when the monecious parent had a strong male tendency, the heterozygotes even underwent phase (1), with (3) occurring very late. Such heterozygotes therefore also showed a resemblance to monecious segregates. The assumption that expression of the factor for femaleness involves the shifting of all phases towards the base of the plant was confirmed by the production of a true-breeding hermaphrodite type, when the factor was introduced into an andromonecious type. The evolution of diecious species from monecious ones as the result of female-type mutation was discussed.

2386 Cicin, N. V.
(Some results and aims of distant hybridization in breeding plants and animals).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1958 : No. 5 : 17–22. [Russian].
[Cf. XXVIII, 3966].

2387 de Haan, H.
Soortskruisingen bij cultuurplanten. **(Species crosses in cultivated plants).**
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1958 : **15** : 92–93.
Well-known examples of interspecific and intergeneric crosses in legumes, cereals, grasses and potato are briefly surveyed.

2388 Nybom, N.
Metody mutacyjnej hodowli roślin. **(Mutation methods in plant breeding).**
Postępy Nauk Roln. 1957 : **4** : No. 3 : 113–21.
Methods of inducing mutation are surveyed, mention being made of the use of temperature, chemicals, antibiotics and different forms of radiation.

2389 D'Amato, F., Avanzi, S., Moschini, E. & Scarascia, G. T.
Primi risultati italiani sugli effetti di radiazioni ionizzanti in piante agrarie. **(The first Italian results on the effects of ionizing radiations on agricultural plants).**
Att. V Rassegna internaz. elettron. nuclear., Roma 1958 : Pp. 26.
Experiments on the effects of ionizing radiation on plants were started in Italy in 1954, with tobacco, and later extended to wheat, flax and other plants. An outline is given of the results. Seed of *Triticum durum* 'Cappelli' and *T. vulgare* 'Brescia' that had been irradiated with thermal neutrons showed less chromosome damage and correspondingly less retardation of root growth than that treated with X rays. Certain doses of both thermal neutrons and X rays produced an exceptionally high proportion of small chromosomal deficiencies. The R_1 of Cappelli had a greater proportion of damaged plants than that of Brescia for the same dose. The neutrons caused a higher degree of sterility than the X rays. The percentage of mutants in the R_2 of Cappelli from both treatments was greater than those previously reported for *T. durum*, a larger proportion of chlorophyll deficiencies being found among the mutants in Cappelli than in Brescia.
Experiments on tobacco seeds irradiated with thermal neutrons [cf. XXVIII, 3259] have shown Virginia Bright to be more sensitive than the other cultivars tested in respect of both cytological and morphological aberrations.
Chronic irradiation of flax plants in the gamma field at Brookhaven, NY, produced plants exhibiting fasciation in the R_2, which disappeared however in succeeding generations and was apparently not genetic. In the progeny of seeds treated with doses of 10 Kr., cotyledon anomalies were observed but no fasciation.

2390 Rassenlijst voor landbouwgewassen 1959. **(Varietal list of agricultural crops, 1959).**
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1958 : **15** : p. 94.
Descriptive notes are given on five grasses, one wheat, two barleys, one oat variety, five potatoes, one fodder turnip, one fodder maize and one vetch to be included in the Netherlands varietal list of agricultural crops [cf. XXVIII, 3574].

2391 Mothes, K.
Einführung in die Diskussion über chemische Rassen. **(Introduction to the discussion on chemical races).**
Pharm. Weekbl. 1957 : **92** : 817–20.
A brief survey of types of chemical races found in various crops is presented, reference being made to the following topics: the possibility that a single racial phenotype may be conditioned by a number of different genotypes, each having a different biochemical effect; the selective effects of varying concentrations of biochemically active substances in the plant; and the relation between morphological and biochemical differences. Examples are taken chiefly from studies of tobacco.

2392 van Os, F. H. L.
Les races chimiques dans le groupe des plantes à hétérosides. **(Chemical races in the group of plants containing glycosides).**
Pharm. Weekbl. 1957 : **92** : 846–52.
In addition to some examples of plants differing solely in the presence or absence of one or more chemical compounds and not in morphology, details are given of investigations on glycosides in *Rheum palmatum*. By means of self fertilization it has proved possible to develop lines with

high and low glycoside contents; these lines include a large variety of morphological forms. A low ratio of rhein to chrysophanol is characteristic of *Rh. officinale* and is found in some inbred lines of *Rh. palmatum*; independently of this character, a morphological resemblance to *Rh. officinale* is also found in some lines. At the Wageningen Horticultural Plant Breeding Institute, Netherlands, induced chromosome doubling in *Digitalis purpurea* and *D. lanata* and in *Fagopyrum sagittatum* and *F. tataricum* did not result in change in content or composition of glycosides in the former two species or rutin content in the latter.

2393 Hegnauer, R.
Phytochemie und Systematik: Eine Rück- und Vorausschau auf die Entwicklung einer Chemotaxonomie. (**Plant chemistry and systematics: a glance into the past and future of the development of chemotaxonomy**).
Pharm. Acta Helvet. 1958 : **33** : 287–305.

After a review of the literature, the author expresses the view that sufficient evidence is now available to show that taxonomically related forms often produce chemical compounds of similar constitution, though exceptions such as the many plants containing inulin are pointed out and ascribed to convergent evolution. Many chemical relationships are shown between taxa that are separated in Hutchinson's system merely because of woody or herbaceous habit.

2394 Hegnauer, R.
Die systematische Bedeutung des Alkaloidmerkmales. (**The systematic importance of the alkaloid character**).
Plant. med., 1958 : **6** : 1–34.

The alkaloids are arranged in families according to the aminoacids on which they are based and tables are given showing (*a*) the alkaloids that occur in the different families of the plant kingdom and (*b*) the families that are known to contain any given alkaloid. The possession of common alkaloids suggests certain taxonomic relationships. Thus the Polycarpieae and Papaveraceae seem to be related to each other and to the Rutaceae on the basis of the phenylalanine alkaloids and also to the Centrospermae and Rosales. Lysine alkaloids are characteristic of the Leguminosae and of the Polycarpieae-Papaveraceae group, ornithine alkaloids of the Erythroxylaceae-Convolvulaceae-Solanaceae group and tryptophane alkaloids of the Logiaceae-Apocynaceae-Rubiaceae.

2395 Lundin, P.
Aktuella problem inom resistensförädlingen. (**Current problems in resistance breeding**).
Weibulls Årsb. Växtföräd. Växtodling 1959 : **54** : 18–21.

The possibilities of breeding cereals for resistance to mildew, rusts, foot-rot diseases, smut, *Fusarium* diseases and nematodes, and legumes for resistance to *Sclerotinia trifoliorum* rot and nematodes, are briefly discussed.

2396 Mészöly, Gy.
Rezisztenciára-nemesítés feladatai és módszerei. (**Aims and methods of breeding for resistance**).
Magyar tud. Akad. Agrártud. Oszt. Közl. 1958 : **14** : 195–208.

In this general review of foreign and Hungarian work on breeding for disease resistance, it is noted that intervarietal and interspecific hybridization in tomato is in progress in Hungary and that preliminary results with regard to virus resistance have shown promise, *Lycopersicon peruvianum* being a useful parent in this respect. Tetraploid tomatoes are also being used.

In the subsequent discussion, I. Milinkó mentioned that virus-resistant tomatoes have been developed from combinations of Kecskemét varieties and *L. hirsutum*. I. Sárvári reported that hybridization of potatoes with the aim of developing virus-resistant varieties is in progress at Kecskemét. A. Bálint described his use of the method of convergent breeding in the development of maize with complex resistance.

2397 Granhall, I.
Resistensbiologisk forskning och resistensförädling. (**Research in the biology of resistance and breeding for resistance**).
K. Skogs- o. Lantbruksakad. Tidskr. 1958 : **97** : 201–16.

Some results of breeding for resistance to diseases and pests in various crops in Sweden and other countries are reviewed and a collaborative programme for further work in this field at the Swedish State Plant Protection Institute, the Institute of Plant Pathology of the Royal Agricultural College and the various Swedish breeding stations is outlined. In the discussion which follows, the organization of such a programme and some of the crops and diseases requiring special attention are considered in more detail.

2398 Wiebosch, W. A.
De temperatuursinvloed op de ontwikkeling als faktor bij de plantenveredeling. (**The influence of temperature on development as a factor in plant breeding**).
StudKring. PlantVeredel., Wageningen 1958 : 819–28. (Mimeographed).

After an historical survey of work on the effects of temperature upon growth and the reproductive cycle, the main types of vernalization response are described and examples of the cold requirements and sensitivity to day length of different crops are cited from various authors.

CEREALS

2399 Andrews, J. E., Smith, A. D., Grant, M. N. & Wells, S. A.
Variation among rows in power-seeded cereal variety trials.
Canad. J. Pl. Sci. 1959 : **39** : 25–29.

"Variations in survival of winter wheat and in yields of winter wheat, spring wheat, and barley were obtained among rows of power-seeded variety trials where there was differential packing by tractor wheels. This variation makes variety comparisons difficult and introduces bias in single-row-plot and two-row-plot trials. A power seeder with four drive-wheels giving uniform packing of all rows greatly reduced the variation in yield among rows."
[Authors' summary].

2400 **Cereal variety trials, 1958.**
Mon. Rep. Minist. Agric. N. Ire. 1959 : **33** : 300–03.

The results of variety trials of oats and barley in N. Ireland are summarized. Among the oats tested were L275 and L257, two new varieties bred from Elder x Stormont Arrow at the Plant Breeding Division, Loughgall. L275 has been named Stormont Sceptre and is being included in the official seed certification scheme, although seed supplies are not expected to be available until spring 1962. The variety produces short, plump grain. In the trial at Loughgall it gave high yields of grain and straw, respectively 39·46 and 68·12 cwt. per acre and showed a lower percentage of lodging (32·5%) than the other five varieties under test in 1958, which was a particularly wet year.

2401 Popow, G.
Weizenzüchtung und Sortenprüfung in Österreich. (**Wheat breeding and variety testing in Austria**).
Mitt. schweiz. Landw. 1958 : **6** : 161–70.

The impressions gained during visits to some Austrian breeding stations are recorded. The breeding aims of these stations and the characters of some recent cereal varieties are briefly mentioned.

2402 Honkavaara, T.
Syysviljojen kylovöaikakokeet Etelä-Pohjanmaan koeasemalla. (**Experiments on the time of sowing of winter cereals at the South Finland trial ground**).
Maatalous ja Koetoiminta 1958 : **12** : 177–87.

Some comparative data for varieties of winter wheat and winter rye are included in a discussion of the effect of sowing date on grain yield.

2403 Wallin, J.
Maahan saapuvat kaura- ja ohralajikkeet. (**Oat and barley varieties arrive on the land**).
Koetoiminta ja Käytäntö 1957 : **14** : 14, 16.

Oats. The performance of several varieties in different places is compared with Kultasade II [Golden Rain II]. Data are given for Sol II, Marne and Blenda, which are superior to the standard in most years, from a number of stations in southern Finland. Blixt [Lightning] and Pendek are mentioned as particularly suited to central Finland; for north Finland, Orion III and Nip are of particular value.
Barley. Edda II and Åsa are compared with Tammi; both are better yielding on the whole.

2404 Teittinen, P.
Suojakasvina eniten käytetyt kevätviljalajikkeet. (**The spring cereal varieties most used as nurse crops**).
Koetoiminta ja Käytäntö 1958 : **15** : p. 19.

Certain cereals have been shown to be most satisfactory for use as nurse crops for raising the yields of herbage plants. These are Tammi, Pirkka and Balder barley, Apu [Aid] and Tammi spring wheat and Orion, Pendek and Eho oats.

2405 Grønnerød, B.
Sortsforsøk med vårkorn i fjellbygdene 1947–56. (**Variety trials of spring cereals in mountain districts, 1947-56**).
Forskn. Fors. Landbr. 1958 : **9** : 505–26.

Details are given of the performance of barley, wheat and oat varieties tested mainly at Løken Experimental Station, Norway, at latitude 61° N. and at an altitude of 550 m. Some trials were also conducted in southern Norway. Preliminary reports of the results of the wheat and oat trials have already been summarized [XXIV,

2864 and XXVII, 449]. Varde was the best Norwegian six-rowed barley in respect of grain yield and lodging. Several new six-rowed barley lines have shown promise. Among the wheats, Snøgg II outyielded the standard Sibir, was early and had strong straw. The lines V1167, V1094 and V1155 also yielded relatively well, were earlier than their sister line Snøgg II and had a better germination percentage but were less resistant to lodging. The earliest oat varieties were Nidar II, yielding about the same as Perle, and Hein II, yielding rather more and also more resistant to lodging. The choice of suitable varieties of each crop for different districts is discussed.

2406 Berichten over rassenkeuze. (**Reports on choice of varieties**).
Zaadbelangen 1958 : **12** : 337–38.
Results of trials of winter wheat, winter barley and winter rye in the Netherlands are reported [cf. 1336 and 1446].

2407 Chavan, V. M., Argikar, G. P., Salanki, M. S. & Morbad, I. R.
Present position of botanical and agronomic research on *jowar* and *bajri* in the Bijapur district.
Poona agric. Coll. Mag. 1958 : **49** : 5–15.
The article includes a survey of the improvement of sorghum and *Pennisetum typhoides* in the above district of Bombay State by selection and hybridization.

2408 Thorpe, H. C. & Dixon, G. E.
Cereals for 1959/60.
E. Afr. Fmr. Planter 1959 : **3** : No. 5 : 32–33, 40.
Information is given on introduced and locally developed varieties of wheat and barley, introduced varieties of oats and two locally developed synthetics of maize which are recommended for different altitudes in Kenya.

2409 Blackmon, C. R. & Struchtemeyer, R. A.
Small grain variety trials 1954-1957.
Bull. Me. agric. Exp. Sta. 1958 : No. 576 : Pp. 24.
The results of trials of wheat, oats and barley in Maine are given, together with descriptions of recommended varieties.

Cicin, N. V. (Editor)
(**Distant hybridization in the family Gramineae**).
Akad. Nauk SSSR, Moskva 1958 : Pp. 282. [Russian].
This report on the work on intergeneric crosses carried out by a team of investigators at the Main Botanic Garden in Moscow comprises the following contributions.

2410 *Cicin, N. V.* [*Representatives of the new wheat species* Triticum agropyrotriticum perenne (*Cicin*)]. (*pp. 5–18*).
Further details are given of the origin of perennial wheats M1 and M2 (cf. XXVI, 285] and of their characteristics. Data presented show that in both perennial hybrids growth of the first roots and shoots is slower than in either spring or winter wheat and one primary root develops at first, as in *Agropyron*, rather than three as in wheat. Tillering begins only after 21–25 days, not 15–20 days as in wheat. When sown in autumn they grow prostrate like winter wheat and when sown in spring upright like spring wheat; under favourable conditions as many as 60 ear-bearing tillers per plant may be produced. The straw is hollow but very flexible and resists lodging. Ripening begins at the tip of the ear and proceeds downwards as in *Agropyron*. Awns occur on the palea of the third, fourth and even fifth floret in the spikelet. The grains thresh easily but do not shed and the rachis is tough.
The secondary tillers that develop after the first set may give a second crop of grain in the south but in the Moscow region they are used for green fodder or hay. There is some variation in the height at which the new tillers are formed; those that form at or below ground level naturally take root more easily; the differences are conditioned more by environment than by hereditary constitution. In the following spring tillering starts again in some of the plants, the proportion of which varied in Moscow in 1951 from 20 to 57% in M2 and from 13 to 53% in M3, the respective means being 39% and 32%. In 1952, in the third year of growth, the number of survivors varied from 8·2 to 15·2%. The survival was greater in plants that had been cut for hay than in those cut for grain. Only a few plants continued into the third, fourth and fifth years. In the greenhouse the plants have been maintained for 5–6 years and even longer.
On account of their open flowering the perennial wheats show a great tendency to be out pollinated by bread wheats or by wheat-rye hybrids; they are less successful when used as the pollen parent in the same combinations. The hybrids produced in either case display considerable sterility.
Both M2 and M3 possess great resistance to fungous and bacterial diseases and have not so

far been attacked by smuts or bunt, rust, mildew or ergot.
The grain yields from M2 have varied from 10 to 17 c. per ha. under conditions where winter wheat gave 20–35 c. but the hybrid is thought to be of distinct value as a forage plant, in that it gives either a crop of grain followed by a crop of hay or three crops of hay; in the former case a yield of 21·9 c. of grain and 14·9 c. of hay per ha. was obtained in 1952 and 8·8 c. of grain with 34·2 c. of hay in 1953 near Moscow; in the latter case the yields were 121·8 c. and 103·6 c. of hay per ha. in the two years respectively. The grain is vitreous and has a protein content of 22–25%, as compared with 14–16% in winter wheat; its quality is also high.
The perennial wheat is classed as a new species, *Triticum agropyrotriticum perenne.*

2411 *Cicin, N. V. & Petrova, K. A.* (*Hybridization of wheat with* Elymus giganteus). (*pp. 19–40*).

A fairly wide range of types was found in the species *E. giganteus* and those thought most suitable for crossing were chosen on the basis of length of ear and number and size of grains. The morphological and biological characteristics of the plants are described; they are typical winter plants and flower only in the third year or later. The pollen can be kept viable for three days in parchment bags at 18–20° C. but fresh pollen gave the best results. The species is normally cross pollinated and the amount of set from selfing varies in different plants. In crossing, the wheat generally served as seed parent and the *E. giganteus* as pollen parent; young plants of the wheat parent gave the best results, pollination being effected on the day after emasculation and repeated on the following day. The majority of the ears of *Triticum durum* 'Melanopus 69' pollinated by *E. giganteus* '61' had only one grain but some had up to 9 and even 12, which amounts to 50%. In this combination 229 grains were obtained and gave rise to 88 hybrid plants. Other parental combinations were less successful, *T. persicum* x *E. giganteus* '59' giving one hybrid and *T. vulgare, T. compactum* and *T. turgidum* none at all. In general, hybrid varieties, as pointed out by Mičurin, crossed more successfully than pure varieties; the most successful of all was *T. durum* 'Melanopus 69', which also crosses well with *Agropyron* spp. The success of the cross also depended on the line of *E. giganteus* used.
The hybrid grains are defective in endosperm formation and do not germinate; seedlings can be obtained by removing the embryo and culturing it in an agar medium containing $Ca(NO_3)_2$, $MgSO_4$, KNO_3, KCl, KH_2PO_4, $Fe_2(SO_4)_3$, $CuCl_2$, $MnCl_2$, H_3BO_3, $ZnCl_2$, thiamine, riboflavin, nicotinic acid, yeast extract and sucrose. At a pH of 6·3 growth was very slow and tillering began only after several months, variation in this and in the date of earing being observed in the first generation plants. The shoots that came into ear late tended to have branched ears. Most of the hybrids eared in the first year, being spring forms like the wheat parent. If they are sown late, in the middle of the summer, they will survive the winter. In morphology the hybrids resemble the *Elymus* parent, having numerous tillers, long ears varying from 16 to 25 cm. in length, with 18–25 spikelets, and a deep root system. They are immune from rust, but vary in resistance to mildew and ergot.
The hybrid from *T. persicum* eared only in the second year; in morphological features it is intermediate between the parental species but it is less vigorous than the hybrids from *T. durum* and gives less aftermath after cutting the mature ears. It is resistant to rust and mildew.
Both sets of hybrids are sterile.

2412 *Mahalin, M. A.* (Secale-Agropyron *hybrids*). (*pp. 41–50*).

A set of grain varying from 1·5 to 6% was obtained in crosses of winter rye with *A. glaucum*, according to the parental forms used. The germination percentage of the grains produced varied from 45 to 65%; in those from winter rye x *A. elongatum* it was only 3–4%. The seedlings developed slowly at first; they were intermediate between the parental species in most characters, those of *Agropyron* being slightly predominant, especially in the hybrids from *A. elongatum*. Segregation was observed in the F_1; most of the hybrids were perennial and some of them persisted for 10–12 years. The plants tiller profusely and can be cloned; they are resistant to rust and mildew but not to ergot.
The chromosome number of the hybrids is $2n = 28$, meiosis is very irregular and they are almost completely sterile; in pollinations of over 66,000 florets only 14 grains were obtained. By colchicine treatment of various hybrids of Vjatka rye x *A. glaucum* a number of amphidiploids were produced. These were predominantly cross pollinated but in the second and third years of growth formed 3–4% of grain also on selfing, the grains being very variable in size and form; they had large embryos however and germinated well. The second generation was also slow in development and segregated

in morphological characters; they were all characterized by the presence of long cilia on the keel of the flowering glume, a feature which distinguishes them from the *Triticum-Agropyron* hybrids. The ears of the amphidiploids were larger than those of the F_1; all had $2n = 56$ but their fertility varied with the temperature and other conditions at the time of meiosis, hot weather during anthesis having an unfavourable effect on seed set; it varied also with morphological type, those that resembled the F_1 having more fertile pollen than the so-called tall type, which grows to a height of 115 cm., in which the pollen was all sterile.

The amphidiploids have been crossed with annual and perennial ryes, with amphidiploid *Triticum* x *Agropyron* hybrids and with rye-wheat amphidiploids. Sets were obtained in pollinations of winter rye, various forms of perennial rye and perennial wheat M2, all other combinations being unsuccessful. In those combinations that succeeded the grain was rather shrivelled and its germination capacity low but the hybrids are thought to be of undoubted interest for further breeding work with rye.

2413 *Mahalin, M. A.* (*Crosses of barley with* Elymus). (*pp. 51–54*).

Further data [cf. XXVI, 283] are given on the crosses between barley and *E. mollis*, *E. giganteus*, *E. arenarius* and *E. condensatus*. All of them gave grain but only one, that from *E. mollis*, produced a seedling; this died at the three-leaf stage.

2414 *Cicin, N. V. & Petrova, K. A.* (*Formation of shoots in some winter hybrids of* Triticum *x* Agropyron *in the period of autumn growth when sown at different times*). (*pp. 55–72*).

The development of the shoot and the ear primordia is described in wheat, rye and the annual and perennial forms of *Triticum* x *Agropyron* hybrids. Some of the perennial hybrids behave as alternative wheats and form ear primordia when sown either in spring or autumn; of the annual hybrids some behave as spring wheats and others as winter. In comparative tests of winter injury in pots without snow certain hybrids proved no more hardy than the winter wheat Kooperatorka but perennial wheat M2 was hardier than the hardiest winter wheats such as Lutescens 329, Ul'janovka and wheat-rye hybrid 46/131, being almost equal to rye and *A. glaucum* in cold resistance. The annual hybrid 599 was roughly equal to Lutescens 329 and Ul'janovka in hardiness.

Several of the hybrids differed in hardiness according to the sowing time, though the differences did not seem to be related to the length of their vernalization requirements and are thought to be connected with differences in the metabolic activity of the cells, particularly at the time of onset of winter. The hardiness was estimated most successfully by the degree of damage to the growing point in the following spring.

2415 *Cicin, N. V. & Petrova, K. A.* (*The nature of the summer-autumn aftermath of the perennial hybrids of* Triticum *x* Agropyron *and their overwintering*). (*pp. 73–92*).

Grass species are classified according to the degree of development of the ear primordia in the secondary tillers at the end of autumn when the winter rest period begins; they are more advanced for instance in *Agropyron cristatum* than in *A. elongatum*, whilst *A. glaucum* in this respect is intermediate. Those species in which the ear primordia are already present are not necessarily less winter hardy than those that enter the winter period in a completely vegetative state, though those in which the primordia have begun to elongate are definitely less hardy. In hybrids of wheat x *A. elongatum* the ear primordia form but do not elongate and the hybrids are classed as winter types; the same applies to hybrids obtained from back crossing *Triticum* x *Agropyron* hybrids to *A. elongatum*; most of them were very winter hardy, though some were not, showing that other factors too are concerned in winter survival. Many of the hybrids with *A. glaucum* on the other hand behave as spring types; among the perennial hybrids both classes occur. Perennial hybrid M2 behaves in the first year as a winter type but in succeeding years as a spring type: after the first crop of grain its secondary tillers develop and may even come into ear; if cut down, its tillers will continue to develop until the winter sets in, as in *A. glaucum*. The supply of reserve materials is however lower in M2 than in *A. glaucum* and after even a fairly mild winter many of the tillers are damaged. For this reason the most promising way of utilizing this hybrid in practice is as an annual plant for producing grain and fodder.

The back-cross hybrids of M2 x *A. glaucum* are similar in developmental type but form more rhizomes, which remain in the ground in a vegetative state through the winter and many of them may survive the milder winters. Crosses of M2 with *A. glael* and *A. elongatum*

and crosses between different hybrids often produce plants in which the ear primordia remain undeveloped through the winter and the tillers remain undamaged. Occasional segregates among the perennial hybrids too display reduced development in the autumn and are winter hardy and it is suggested that selection towards this type may lead to the production of more useful perennial hybrids than those developed so far.

2416 *Ljubimova, V. F. & Kazakova, V. S.* (*New forms of perennial wheat*). (*pp. 93–98*).

Data are given showing the behaviour of a number of perennial plants selected from the F_2 of various *Triticum* x *Agropyron* crosses. In the second year of growth the number of grains per ear varied from 26 to 94, the weight of grain per plant from 9 to 145 g. and the 1000 grain weight from 18 to 41 g. In ear characters most of the selections are intermediate between the two parents. The grain is mostly vitreous and has a protein content of 18–20%. After the grain crop a yield of hay amounting to 158 g. per plant was obtained.
In the third year the plants were transplanted and although this set them back, some of them survived into the fourth year.
All the selections remained free from brown and yellow rust and mildew.

2417 *Cicin, N. V. & Poddubnaja-Arnol'di, V. A.* (*Data on the floral biology of perennial hybrids of* Triticum *x* Agropyron). (*pp. 99–114*).

Cytological studies have shown that perennial wheats M2 and M3 have $2n = 56$ and several of the chromosomes can be identified by their similarity to corresponding pairs in wheat or *Agropyron*. Certain meiotic irregularities were observed and resulted in a slight reduction in pollen fertility, the extent of which varied in different plants; it tended generally to be higher in M3 than in M2. The pollen retained its viability for less than four hours at room temperature and unlike that of *A. glaucum* and *A. elongatum*, pollen of the hybrids, both annual and perennial, failed to germinate at all on artificial media. Similar irregularities were often observed also in macrosporogenesis. After fertilization the differentiation of the embryo and endosperm took place more slowly than in the pure parental species and was upon occasion arrested.
The variation in degree of irregularity makes it possible to exercise selection and in this way a number of lines distinguished by greater fertility have now been produced.

2418 *Petrova, K. A.* (*Development of the embryo sac in perennial wheat M2*). (*pp. 115–29*).

M2 has an average of 26 spikelets per ear, with 4–6 florets per spikelet; the number of florets that fail to form grain varies however from 20 to 60%. A study of embryo-sac development in the first three years of growth showed it to be normal in 85% of the florets in the first year, in 82·5% in the second and in 77·8% in the third. The number of fertile egg cells was also roughly the same in the first and second years. The normal course of development of the embryo sac is described. In M2 no marked deviations from normal were detected in the early stages; most of the ovules formed normally and meiosis took its normal course; a certain number of ovules were observed in which development of the embryo sacs was arrested at the 4–8 nuclear stage; in most cases however development was arrested at a later stage, when differentiation was about to begin and growth processes were at their most active; this critical period coincides with ear emergence, when the plant is very sensitive to deficiency in humidity and nutrients and to changes of temperature. The stamens, which develop somewhat later, are still more sensitive to these factors and sterility is thought to be ascribable more to deficient pollination than to defective embryo sacs. The spikelets in the centre of the ear show a lower proportion of sterile florets than those at the base and the tips.

2419 *Ivanovskaja, E. V.* (*Embryo structure in* Triticum *x* Elymus *hybrids*). (*pp. 130–43*).

By excising the embryos and culturing on an agar medium containing sugar and mineral salts mature plants were produced from several hybrids, some for the first time, viz. in *T. durum* x *E. arenarius*, *T. durum* x *E. giganteus*, *T. compactum* x *E. giganteus* and some crosses of *T. vulgare* x *E. arenarius*.
Examination of a number of grains in combinations that failed to germinate normally showed that nearly all of them had embryos, though of varying size and degree of differentiation. Some of the embryos failed to germinate even on artificial media and were found to have defects in epithelial development and hence in their capacity to absorb nutrients; the scutellum was often enlarged, consisting of undifferentiated parenchyma; in *Secale* x *Agropyron* hybrids on the other hand it was reduced

or even absent. Various other anomalies are described and illustrated; some of them suggest that the epiblast is a rudimentary cotyledon. In all cases where the embryo was large and well developed, as in the cross Flora 5 x *E. arenarius*, the resulting plants were also large and vigorous; and those crosses in which the embryo showed the most pronounced resemblances to *Elymus* also showed them in the mature plant.

2420 *Ljubimova, V. F.* (*The influence of temperature on gametogenesis and fertility in the first generation hybrid of* Triticum *x* Agropyron). (*pp. 144–54*).

Observations were made on anthesis, meiosis and set of grain in the F_1 hybrids *T. vulgare* x *A. elongatum* and *T. durum* x *A. elongatum*. The degree of irregularity at meiosis and the number of bivalents varied with the weather conditions during anthesis. Thus hybrids of *T. vulgare* x *A. elongatum*, having 56 chromosomes, formed 24–28 bivalents in cool weather, where the temperature did not exceed 20° C., and only 12–14 in hot weather with temperatures up to 37° C., which caused greater meiotic irregularities and reduced fertility. In some hybrids however irregularities occurred even under optimum weather conditions. At low temperatures the chromosomes tended to become shorter and thicker.

The proportion of normal pollen grains was also higher in ears that developed in relatively cool weather, when it amounted to 40–67%, while in hot dry weather it was sometimes as low as 10–17%. When the humidity of the air was low the anthers failed to dehisce whatever their pollen content.

The set of grain was also least when the weather had been hot and dry during anthesis, though no reduction was observed in the parental species under similar conditions.

2421 *Ljubimova, V. F.* (*Influence of temperature and air humidity on the development of fertile pollen, anther dehiscence, and grain set in hybrids of low fertility*). (*pp. 155–80*).

In view of the effect of high temperature and low air humidity in increasing meiotic irregularity and reducing fertility of *Triticum* x *Agropyron* hybrids [cf. 2419], the situation in other groups of plants was investigated. Confirmation was found in the works of Darwin, Correns and a number of more recent authors, working with pure species.

The grain set per ear in perennial wheat M2 varied from 21 to 73%, according to the conditions under which it was grown. When M2 was back crossed to the winter wheats Moscow 2453 or *Triticum* x *Agropyron* hybrid 599 many of the hybrids had 49 chromosomes, 28 from M2 and 21 from the winter wheat; the amount of normal pollen in the hybrids also varied, being generally lower however than in M2. Thus in the main tillers the average percentage of good pollen was 65·9 in M2, 31·9–35·1 for the hybrids from 599 and 27·2–29·1 for those from Moscow 2453; the hybrids where M2 served as seed parent had slightly better pollen than the reciprocals. Little difference was observed between plants grown in the field or indoors. The hybrids had a lower tendency towards self pollination and most of their anthers emerged from the floret, particularly under dry conditions. The proportion of anthers that dehisced varied in M2 from 4·7% in the open to 51·7% in a moist chamber; for the hybrids the corresponding figures were 0 and 23·1%. A strong correlation existed between the percentage of good pollen, anther dehiscence and percentage of grain set. This varied from 17·3 in the open to 67 in the moist chamber in M2; in the hybrids the mean set of grain varied from 6·6% to 11·3% and here again higher sets, up to 29% in M2 x 599, were obtained in the moist chamber.

Corresponding figures are given for the ears that developed on the secondary tillers, in which meiosis took place at a much higher temperature. Much greater differences were noted in this case between plants grown in the open, in which meiotic irregularities were more frequent, and those grown in moist chambers. In M2, chromosome conjugation was almost normal in the moist chambers and the percentage of good pollen was 58, compared with 20·3% in the open; in the hybrids the corresponding figures were 31·5% and 7·8%; in the latter case a certain number of giant pollen grains, obviously resulting from dyad formation, were observed in many of the anthers. The number of anthers that dehisced amounted to 61·1% in M2 in the moist chambers and only 33% in the open, where hardly any of the pollen in the hybrids dehisced. The grain set in M2 was 50·3% in the moist chambers and 8·3% in the open, and in the hybrids 16–23% in the moist chambers and 1·1–2·4% in the open.

Although the hot dry weather during meiosis reduced the fertility of the hybrids in this way, it had no effect on the two winter wheats used in the crosses, nor on *A. glaucum* or *A. elongatum*. Low temperatures of 2–5° C. also reduced

the fertility in both M2 and the hybrids. On the other hand some of the other 56-chromosome hybrids of *Triticum* x *Agropyron* have proved to be meiotically just as stable as the pure species, though some of them still give slightly reduced sets of grain on selfing. It is concluded from the results however that the grain set of hybrids with low fertility can be materially increased by abundant watering and maintaining the temperature at 20–25° C. at the time of anthesis.

2422 *Ragulin, A. A.* (*Questions of crossing wheat with* Agropyron). (*pp. 181–96*).

In crosses carried out over the period 1940–46, pollinations of spring bread wheats and durum wheats with *A. glaucum* were equally successful, giving an average set of over 52%, whereas those with *A. elongatum* gave only 21–22% from *T. vulgare* and 45·5% from *T. durum*; when winter bread wheats were used the sets were 49·7–56·1% for *A. glaucum* and 18·1–19·3% for *A. intermedium*. A certain amount of variation occurred according to the variety of wheat and the strain of *Agropyron* sp. used; the most successful wheat for crossing with both species was Alborubrum 25636, which gave a set of 92% with *A. glaucum* and 59% with *A. elongatum*. The sets were invariably lower when wheat was used as the pollen parent. Little or no difference was observed in the results from crosses made in Moscow and Siberia respectively, except that the set from 42-chromosome wheat x *A. elongatum* at Moscow was lower, probably owing to the delayed flowering of the latter species: pollination of small secondary tillers gives reduced set of grain but is often necessary in crossing with *A. elongatum*. In crosses with other species, good sets were obtained with *T. timopheevi*, which with *A. glaucum* gave 44·6% and with *A. elongatum* 40·6% set.

The F_1 *Triticum vulgare* x *A. glaucum* hybrids were more difficult to cross with spring wheat than those from *A. intermedium*, the respective sets being 0·5 and 3·5%; in crosses with *T. durum* the sets were 1 and 0·4% respectively, and with winter wheat 0·4 and 2·6% respectively. Pollinating the hybrid with its parental wheat species did not always give a better result than pollination with other species; the success seems to be determined more by the particular *Triticum* x *Agropyron* combination in the hybrid, and by weather and other influences. In these crosses too, much better sets were obtained when wheat was used as the seed parent.

2423 *Palamarčuk, I. A.* (*A sterile hybrid of rye x* Agropyron *and overcoming its sterility by amphidiploidy*). (*pp. 197–207*).

Hybrids were produced by crossing *Secale cereale* x *A. glaucum*, though the reciprocal cross was unsuccessful. The hybrid plants were perennial, vigorous and hardy but were sterile; even when pollinated with the parent species they set very few seeds. Their chromosome number was $2n = 28$ and pollen meiosis was extremely irregular, few if any bivalents and no normal pollen being formed. Rye pollen germinated on the stigma of the hybrids but their embryo-sac development was also irregular and very few normal ovules were formed and no fertilization was effected.

By growing clones of the hybrid in colchicine solutions, amphidiploids with $2n = 56$ were obtained from five different combinations, the most effective concentration being 0·5%. The ears on the amphidiploids had 50% good pollen but set only 5–6 grains, which were larger than those of the rye parent; in all, 247 grains were obtained, 153 well formed and the rest somewhat defective; in all cases the grains seem highly vitreous.

2424 *Artemova, A. S. & Jakovlev, A. V.* (*New spring varieties of* Triticum *x* Agropyron *hybrids*). (*pp. 208–21*).

Hybrids of the spring wheat Lutescens 62 x *A. glaucum* were back crossed to Lutescens 329, a winter wheat; hybrids in the eighth generation of this back cross were then crossed with the *Triticum* x *Agropyron* hybrid Skorospelka [Early wheat], which in its turn had been produced by back crossing a hybrid of Lutescens 62 x *A. glaucum* with the winter wheat Kooperatorka; from this cross hybrid 56, a spring wheat of var. *lutescens*, was selected. Hybrid 173 was produced by crossing the hybrid Skorospelka with hybrid 599 [cf. XXVI, 286]; it belongs to var. *erythrospermum*. Both hybrids are spring wheats distinguished by high yield, resistance to lodging, shedding, drought, smut, bunt, yellow rust and to a lesser extent, brown rust, and having large grain of good baking quality. In trials carried out under irrigation near Alma Ata in the years 1952–56, hybrid 56 gave a mean grain yield of 31·7 c. per ha., 173 gave 30·1 c. and the standard variety for the area, Erythrospermum 82/2, only 25·6 c. The superiority of the hybrids was most marked in moist years but even in a year of severe drought their respective yields were 28·5 c. and 25·4 c. per ha. In the unirrigated zone in the drought year 1955 both hybrids yielded as well as the drought-

resistant variety Erythrospermum 841 and in years with better rainfall hybrid 56 exceeded it by 14·1 c. per ha. and was entirely free from lodging, whereas the standard lodged very badly. Hybrid 56 is earlier than most other varieties, 173 being considerably later. In flour quality, hybrid 56 is superior and hybrid 173 roughly equal to Erythrospermum 82/2. Figures are given showing that in many areas hybrid 56 excels the local standards, whereas in certain areas the best results have been given by hybrid 173.

2425 *Kryžanovskij, F. D.* (Triticum-Agropyron *hybrid 1*). (*pp. 222–31*).

Hybrid 1 arose from a cross of perennial wheat 34085 [XXVI, 285] which is very winter hardy in the first year and resistant to smuts, rust, lodging, shedding and winter killing from standing water, with a Squarehead type. Selection among the progeny gave rise to hybrid 1 [XXVI, 286]. It ripens some six days later than hybrid 599 but has strong straw and is less prone to lodging than any other winter wheat grown; it is sensitive to conditions of cultivation but on good soils it is very winter hardy and has given yields of over 30 c. per ha.; it is moderately resistant to bunt and rust; in milling and baking quality it is slightly inferior to 599 but some hybrids from it show improvements in this respect; one of them is hybrid 637. Hybrid 1723 is hardier and earlier than hybrid 1 and also has very strong straw. Hybrid 1800 is similar to 1723 but superior in yield and size of grain.

By crossing hybrid 1 with branched winter wheats some lines have been produced in which the lower spikelets are branched and bear 16–20 grains; another has branched spikelets all along the ear, which bears a total of 130–150 grains.

2426 *Gorjunov, D. V.* (*Winter hybrids of* Triticum *x* Agropyron *in agriculture*). (*pp. 232–82*).

Hybrid 599, produced by crossing rye-wheat hybrid 46/131 with *A. glaucum*, back crossing the hybrids to the maternal parent and selfing, has given yields of 50–55 c. per ha. on good soil. Hybrid 186 [XXVI, 286] is classed as a strong wheat of good quality and is early, free from lodging, high in yield and good in quality.

Hybrid 1 [cf. 2425] has done particularly well in Latvia and other Baltic countries; it has excelled all other wheats in lodging resistance and has given grain yields of up to 74·6 c. per ha.

Details are given of the area on which the hybrids are cultivated in different parts of the Soviet Union and of the yields obtained. Yields of 50 c. per ha. and over have been produced for the first time in many localities by growing hybrid 599 under good conditions. Hybrid 186, which is rather less exacting as regards conditions of growth, has given still higher yields and matures 3–6 days before most other wheats. Both these wheats usually excel hybrid 1 in grain yield, earliness and winter hardiness; all three are unusually strong in the straw and fairly resistant to smuts, rust, mildew, *Fusarium* and frit fly and good in quality.

2427 Jones, D. F.
Heterosis and homeostasis in evolution and applied genetics.
Amer. Nat. 1958 : **92** : 321–28.

In this discussion of heterosis and homeostasis reference is made to cereal breeding and in particular the breeding of maize in Connecticut and Iowa.

2428 Avanzi, E. & Benvenuti, A.
Nuove razze di grano e di avena in prova nel quadro dell'attuale problema cerealicolo italiano. (**New varieties of wheat and oats being tested in the light of the present situation of cereal growing in Italy**).
Sementi elette 1958 : **4** : No. 6 : 12–17.

Two winter wheats and two oats are described. The wheat Ancona mutico [Awnless Ancona] is an awnless selection from Ancona; it is early and cold resistant. CM 114 is a selection from the cross Marchetti 114 x C. Mazzoldi and is distinguished by strong straw, cold resistance and extreme earliness.

The oat Potenza [Power] is early and resistant to diseases, cold and lodging and has yielded about 40 c. of grain per ha. at Pisa. The oat Ragusa is short, free from lodging, winter hardy and early and has yielded about 42 c. per ha.

2429 Wells, D. G.
A useful plant marking tag.
Agron. J. 1959 : **51** : 119–20.

The use of a laundry "daily delivery" tag has been found to be more satisfactory than the common paper marking tag with an attached loop of string, as a means of identifying parents of controlled crosses in cereal breeding at the Mississippi Agricultural Experiment Station. The laundry tag consists of stiff white or red cloth and at one end has a wire spring clasp inseparably attached, which can be easily clasped on to the folded lower end of a tubular glassine bag and may be depended on to keep the tube closed until released. The cloth is easy

to write upon and sufficiently large to accommodate all the necessary figures. The tag does not get torn in the wind and retains the writing for several weeks in the open.

2430 Sarič [Sarić], M.
(The phenomonen of branched inflorescences in cereals).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1958 : No. 5 : 121–26. [Russian].

Analyses of progenies of wheat and barley with branched ears and of oats with branched culms at Zemun-Polje, Jugoslavia, suggest that inflorescences of a branching type are largely due to environmental factors.

2431 Grafius, J. E. & Kiesling, R. L.
Vector representation of biologic fields of force.
Agron. J. 1958 : **50** : 757–60.

A communication on the above topic has been summarized earlier [XXVIII, 1318]. In the present paper, the effects of mildew on barley and of night temperature on oats were determined by ascertaining the angles between appropriate vectors representing the relevant data on yield.

2432 Bericht über die Tätigkeit der Forschungsanstalt für Landwirtschaft Braunschweig-Völkenrode im Jahre 1957.
(Report on the activity of the Agricultural Research Institute, Braunschweig-Völkenrode in the year 1957)
1958 : Pp. 84.

Cereal varieties have been tested for cold resistance and investigations made on the length of the growing period. In hybrid maize, no correlation was found between 1000-grain weight and germinating capacity but the shape of the grain influenced the germination.

2433 Inamura, H., Yamaga, I., Suzuki, K. & Gokan, M.
(Studies on breeding early varieties of barley and wheat. I. Relation between death of the young ear due to freezing and elongation of the internodes in barley and wheat varieties in early spring).
Kantotosan Nogyo Shikenjo Kenkyu Hokoku/J. Kanto-Tosan agric. Exp. Sta. 1958 : No. 11 : 20–28. [Japanese].

It was found, in a study of some 20 varieties of both wheat and barley, that death of the young ear due to spring frost is liable to occur as soon as internode elongation has brought the ear above ground-surface level. The time at which the ear is brought to this position is greatly influenced by temperature but is also a varietal characteristic which varies to some extent even between varieties with the same heading date.

2434 Inamura, H. & Nonaka, S.
(Studies on breeding early varieties of barley and wheat. II. On culm elongation, the heritability of heading, their genetic correlation and selection of combinations in wheat).
Kantotosan Nogyo Shikenjo Kenkyu Hokoku/J. Kanto-Tosan agric. Exp. Sta. 1958 : No. 11 : 29–35. [Japanese].

The heritabilities of time of culm elongation, time of heading and ear weight were ascertained from a biometrical analysis of parental, F_2 and F_3 generations of the crosses Norin 16 [Ministry of Agriculture and Forestry 16] x Norin 20, Norin 61 x Konosu 25, Norin 53 x Konosu 25 and Norin 71 x Konosu 25. The respective heritabilities (in the narrow sense) of the three characters mentioned were 22·64–50·68, 44·74–70·15 and 0·71–7·19% for the F_2 and 35·71–62·61, 58·84–78·70 and 1·14–10·90% for the F_3. Genetic correlation between time of culm elongation and time of heading was high and it is therefore necessary to employ large populations when breeding for early-heading varieties with late culm elongation. It was calculated that the first two crosses provided the most promising material for this breeding objective.

2435 Hoffmann, W.
Kälteresistenz und Kälteresistenzprüfung bei Wintergetreide. **(Cold resistance and testing cold resistance in winter cereals).**
SB dtsch. Akad. LandwWiss. Berl. 1957 : **6** : No. 7 : 1–37.

A short discussion of the physiology of winter hardiness is presented and methods of testing winter hardiness are critically reviewed. The chief difficulty encountered in this work is the rarity of severe winters. Methods enabling selection for hardiness to be made even in mild winters are considered in some detail. These methods include vernalizing the seed before sowing in the autumn; this treatment decreases the resistance to cold, the decrease being least marked in the most hardy plants. The results of tests with winter barleys and wheats are used to illustrate this method. Another test involves lengthening the photoperiod during the winter months; the difference in hardiness between resistant and susceptible varieties is then greatly increased [cf. XXIII, 2577]. A third method developed at Weihenstephan involves growing the seedlings in boxes raised from the ground

and so exposed to winter conditions [cf. XXV, 938]. During very mild winters, a combination of these methods is desirable. If no frost damage occurs during the winter, information on cold resistance may still be obtained by observing the increase in length of the ear primordia in plants subjected to increased photoperiod; there is a negative correlation between winter hardiness and the increase in length [cf. XXVIII, 1534].

2436 Jamalainen, E. A.
Peltokasvien huonon talvehtimisen syistä ja talvetuhosienien aiheuttamien vahinkojen torjuntatoimenpiteistä. (**On the reasons for poor overwintering of field crops and control measures against damage caused by fungi during the dormant period**).
Maatalous ja Koetoiminta 1958 : **12** : 55–63.

Varieties of winter rye and winter wheat most suitable for chemical treatment to control attack by fungi (*Fusarium nivale* and *Typhula* spp.) during the winter period are indicated.

2437 Tinline, R. D. & Dickson, J. G.
***Cochliobolus sativus* I. Perithecial development and the inheritance of spore color and mating type.**
Mycologia 1958 : **50** : 697–706.

Environmental factors influencing the sexual stage of *C. sativus* were investigated with a view to facilitating genetical studies. Random-spore analysis indicated that conidial colour (white and olivaceous) and mating type (A and a) were inherited independently and that probably the two characters each depended on an allelic gene pair.

2438 Cherewick, W. J.
Cereal smut races and their variability.
Canad. J. Pl. Sci. 1958 : **38** : 481–89.

A large number of collections of *Ustilago avenae, U. hordei, U. kolleri, U. nigra, U. nuda* and *U. tritici* were studied with respect to pathogenic variability by tests on differential varieties and by selective subculturing on differentials. The results indicated that (1) a smut collection sometimes consisted of a pure strain but more frequently comprised mixed or heterozygous strains, (2) repeated passage of a variable culture through selective hosts occasionally yielded a stable strain which may be regarded as a race, and (3) the majority of the variable cultures continued to be variable in repeated passage through selective hosts for as many as ten generations. *U. kolleri* was the least variable, *U. hordei, U. avenae* and *U. nigra* being progressively more variable. No stable strain was isolated from *U. tritici* or *U. nuda* collections. From results of preliminary tests with selfed lines of a number of variable cultures, the development of races homozygous for pathogenicity on differential hosts appears to be a possibility. Identification of races by selfing variable cultures would entail less time and effort than identification by selection of inoculum from differentials. Such stable races would also be particularly valuable in genetical studies of the smut reactions of cereal varieties.

2439 Green, G. J., Peturson, B. & Samborski, D. J.
Physiologic races of the cereal rusts in Canada in 1957.
Robigo, Castelar 1958 : No. 6 : 4–5. (Also in Spanish).

On wheat the most common stem rusts were 15B–1 (Can.), 15B–1L (Can.), 15B–4 (Can.), 56 and 11. Races 5, 15, 28, 58 and 126 were the frequent leaf rusts. On oats, stem rust 7A, which attacks Rodney, has increased slightly, and two new races, 8A and 13A, both attacking Garry and Rodney, have been isolated. Crown rust races 213, 216, 274 and 279 showed increased prevalence. Race 264, which can attack Santa Fe, Landhafer, Bond and Victoria, was isolated.

2440 Johnson, T.
Regional distribution of genes for rust resistance.
Robigo, Castelar 1958 : No. 6 : 16–17. (Also in Spanish).

It is suggested that it might be desirable to plan the distribution of varieties carrying resistance genes in such a way as to minimize the likelihood of the rapid increase and spread of destructive races.

WHEAT

2441 Udvaros, K.
A búzafajták korszerű előállítása, értékelése és hasznosítása. (**Modern methods in the production, evaluation and utilization of wheat varieties**).
Agrártudomány 1958 : **10** : No. 12 : 13–18.

The influence of geographical factors on wheat breeding is emphasized; while varieties bred at Magyaróvár and other places in western Hungary were not successful except locally, other varieties, such as Székács, Bánkút and Kompolt bred at Árpádhalma and other places in the eastern part of the Hungarian plain, are out-

standing for production throughout the country. Average yields of several varieties are quoted.

2442 Varis, E.
Eräiden syysvehnälajikkeiden ominaisuuksista. (**On the characteristics of different varieties of winter wheat**).
Koetoiminta ja Käytäntö 1957 : **14** : p. 4.

The new varieties Antti and Vakka [Bushel] have been compared with Varma [Sure] in trials during 1952–56 at Tammisto and Antila. These are compared for winter hardiness, strength of straw, earliness, yield and baking qualities. Both are superior to Varma in hardiness; Vakka is also superior in strength of straw and earliness. Antti gives appreciably higher yield while Vakka has superior baking qualities.

2443 M., H.
Kevätvehnälajikkeiden satoisuus paikalliskokeissa. (**Yield of spring wheat varieties in local field trials**).
Koetoiminta ja Käytäntö 1957 : **14** : p. 10.

A number of varieties are compared for yield with Timantti [Diamond]. All give a poorer yield except Apu [Aid], Kärni [Kernel] and Timantti II.

2444 Wallin, J.
Syysvehnän lajikekokeet Kasvinviljelylaitoksella. (**Winter wheat varieties at the Department of Plant Husbandry**).
Maatalous ja Koetoiminta 1958 : **12** : 140–46.

A number of winter wheat varieties were compared with Varma [Sure] as standard for yield, overwintering and straw qualities during the years 1931–53. Vakka [Bushel] is the highest yielding and is a hard wheat. It has also short strong straw but a tendency to sprout in the ear under bad harvesting conditions. Antti, another hard variety, and the soft wheat Virtus are also high yielding but have a tendency to lodge.

2445 Roland, M.
Försöken på Bjertorp 1958. (**Research at Bjertorp, 1958**).
Weibulls Årsb. Växtföräd. Växtodling 1959 : **54** : 28–30.

In trials at Bjertorp in southern Sweden, the wheats Banco and Odin have done well but were surpassed by the new variety Starke [cf. 2467]. Among oats, Rex and W16004 gave 5% greater yields than Sol II, Blenda and Sisu [Courage], but both have rather weak straw. The new barley Ingrid [cf. XXVII, 485] equalled Ymer and Bonus in yield but had stronger straw.

2446 Zomertarwe, 1959. (**Summer wheat, 1959**).
Landbouwvoorlichting 16 : Bijl. 35; Ber. Rassenkeuze 1959 : No. 252 : unpaginated.

Data on the performance of eight varieties tested on different soil types in the Netherlands are presented.

2447 Day, A. D.
Ramona 50 and Onas 53 wheat.
Bull. Ariz. agric. Exp. Sta. 1958 : No. 300 : Pp. 8.

Details are given of the agronomic, milling and baking performance of the above two wheats in Arizona. Onas 53 [cf. XXIV, 2850] is recommended for feeding to livestock in various ways and Ramona 50 for milling. Ramona 50 [(Martin x Hard Federation^{3} x Ramona^{6}) x Ramona 44^{2}] was released for commercial production in California in 1950 and approved for certification in Arizona in 1957.

2448 Riley, R.
Wheat genetics.
Nature, Lond. 1959 : **183** : 25–27.

The themes dealt with at the first International Wheat Genetics Symposium, held during 10–15 August 1958 at the University of Manitoba, Winnipeg, Canada, are summarized. The formal meetings were held under the general chairmanship of H. Kihara (Japan) who, in his opening remarks, laid emphasis on the very considerable progress achieved in the cytogenetical study of the Triticinae during the past 40 years, since the correct chromosome numbers of the polyploid series in wheat were determined by Sakamura and by Sax. In assessing the application of back crossing, particularly in crop breeding for disease resistance, F. N. Briggs (USA) stressed that this technique could only be employed when suitable recurrent parents were available and improvement was required with respect to a limited sector of the total range of genetic variation. Combination of back crossing with any other method involved departure from the security of a proven genotype. N. E. Borlaug described the development of stem-rust resistant multiline varieties of wheat in Mexico, each consisting of a mixture of lines produced from back crosses between parents which are genetically different as regards rust resistance and the same susceptible recurrent parent. A single variety may be composed of as many as eight lines. Preliminary trials suggest that, even in the absence of rust, use of multiline varieties may be advantageous.

D. R. Knott (Canada) gave a report of an analysis of 29 wheats among which he has discovered seven different genes for stem-rust resistance. The chromosome on which each gene is carried has been determined by means of monosomics. The effect of each gene is now being studied separately, in the absence of all other genes for resistance, in a common genetic background. A. R. da Silva (Brazil) made a plea for a more precise identification of genetic variation in the host and pathogen as a preliminary to the incorporation of rust resistance in breeding material. He considered that host-pathogen relationships should be envisaged in terms of genes for resistance *vs.* genes for pathogenicity, rather than in terms of rust races *vs.* varieties differing in response to races. In the discussion of these contributions, E. C. Stakman (USA) suggested that resistance was not simply attributable to single genes, since it depended on the overall physiology and morphology of the plant. E. R. Sears (USA) surveyed his research with monosomics and nullisomics in genetical analysis and in establishing the seven homeologous groups. The monosomic series developed by Sears has provided the basis for extensive work on aneuploids in Canada, which was reviewed by J. Unrau. Monosomic series have been developed in more than eight wheat varieties and some genetical analysis of disease and insect resistance and of morphological characters has been accomplished. The genetic breakdown of polygenically inherited characters by aneuploid techniques has been initiated. The occurrence of reciprocal exchange of intact chromosomes between varieties has offered a new means of genetical analysis. Substitution of a particular chromosome pair from another variety may increase the yield of the recipient variety by 50%. Results with induced mutations in diploids, tetraploids and hexaploids were discussed by J. Mac Key (Sweden) and S. Matsumura (Japan), in relation to the extent of the genetical triplication in hexaploid wheat. Their results point to the condition of pronounced triplication, as indicated by the recognition of the homeologous groups by nullisomic-tetrasomic compensations. It has been difficult to reconcile triplication of this order with the diploid type of meiosis found in *Triticum vulgare*. R. Riley and G. D. H. Bell (England) were however able to present evidence, confirmed by Sears, that the cytologically diploid behaviour of hexaploid wheat is controlled by genes on one chromosome, in the absence of which pairing occurs between equivalent, homeologous chromosomes of the different genomes. L. Shebeski (Canada) expressed the view that the presence of the chromosomes of genome D from *Aegilops squarrosa* may restrict advances in breeding common wheat. He and B. C. Jenkins are therefore developing entirely new sets of seven chromosomes, less restricted in gene content, to replace genome D. The production of highly vigorous amphidiploids between tetraploid wheat and rye has been effected by E. Sánchez-Monge (Spain) with a similar aim; their derivatives may be of practical value in certain marginal environments where rye is at present the only suitable cereal. Difficulties in using the concepts of genome analysis were examined by H. Gaul (Germany). Other considerations in the study of polyploids were discussed by R. Riley and G. D. H. Bell, who compared the behaviour of synthetic amphiploids with that of related natural polyploids. This work includes studies of the cytogenetics and breeding value of lines in which single pairs of rye chromosomes have been added to the full complement of wheat chromosomes, or in which a single pair of wheat chromosomes has been replaced by a single pair from rye. The maintenance of varietal collections in connexion with breeding programmes was considered by J. B. Harrington (FAO) and by L. P. Reitz and D. J. Ward (USA). As A. T. Pugsley pointed out, no system was however in existence for co-ordinating the maintenance of wheat material of known genetic constitution. One of the practical results of the symposium was the formulation of a scheme for such coordination. In a session on the application of induced mutation in plant breeding, R. S. Caldecott (USA) considered the control of the mutation process.

2449 Unrau, J.
Genetic analysis of wheat chromosomes. I. Description of proposed methods.
Canad. J. Pl. Sci. 1958 : **38** : 415–18.

"The F_1 obtained from crossing a substitution line with the recipient variety will be heterozygous only for genes on one pair of chromosomes. Crossing-over at meiosis, therefore, will result in recombinations only with respect to genes carried by this pair of chromosomes. The products of such recombinations will be obtained as univalent chromosomes of monosomics when such F_1's are used to pollinate a line of the recipient variety deficient (nullisomic or monosomic) for the chromosome under study. When the monosomics so obtained are individually selfed, approximately 25 per cent of the offspring will be disomic, and homozygous

for the genetic constitution of the backcross monosomics. The relative frequencies of progenies with different genetic constitutions will indicate directly the number and arrangement of genes differentiating the donor from the recipient variety chromosome.

"Genetic differences can be determined specifically for chromosome arms if, instead of whole-chromosome deficient lines of the recipient variety, those with telocentrics are used.

"The possible usefulness of the method for breeding, as well as studies of evolution, is briefly discussed." [Author's summary].

2450 Hurd, E. A. & McGinnis, R. C.
Note on the location of genes for dwarfing in Redman wheat.
Canad. J. Pl. Sci. 1958 : **38** : p. 506.

Dwarf F_1 plants have been obtained from crosses between Kenya Farmer and the 21 monosomic lines of Redman at the Canada Department of Agriculture Research Laboratory, Winnipeg. Segregation for dwarf and normal growth has occurred only in crosses involving monosomics VIII and XIII, plants from crosses with the remaining 19 monosomics being all dwarfs. Dwarfs in the segregating crosses had $2n = 42$, whereas the normal plants in this material were monosomics. Examination of other F_1 lines showed both monosomic and disomic plants to be present. It is tentatively concluded that at least three complementary dominant genes condition dwarfing in this cross, the absence of any one of the genes allowing normal growth. The data indicate that Redman possesses two genes for dwarfing on chromosomes VIII and XIII respectively. The other complementary and nonallelic gene or genes must be carried by Kenya Farmer since dwarfing is only expressed in hybrids between the two varieties. Genes for stem-rust resistance have been located on VIII and XIII in Redman [cf. 2524]. Possibly the genes for dwarf habit and stem-rust resistance are linked.

2451 Aslam, M.
Genetics studies in interspecific crosses between *durum*, *sphaerococcum* and *vulgare* types of wheat.
Agriculture, Pakistan 1958 : **9** : 109–19.

A study was made of the inheritance of ear characters in *Triticum sphaerococcum* 'T7' x *T. vulgare* 'C591' and in several crosses between *T. durum* and *T. vulgare*. Pubescent *vs.* glabrous glumes depended upon a single pair of genes in both interspecific combinations, with pubescence dominant. In T7 x C591, a 3 : 1 segregation was obtained for plants with ears resembling those of *T. vulgare* and *T. sphaerococcum* respectively. No conclusion could be reached concerning inheritance of ear type in crosses between *T. durum* and *T. vulgare*, segregates resembling the parents, *T. spelta* and other wheats, as well as intermediate types, being secured. Ear density and plant height were controlled by multiple factors in both interspecific combinations. In crosses of *T. durum* and *T. vulgare*, red *vs.* white grains depended on duplicate factors, a ratio of 9 dark red : 3 red : 4 light red : 1 white being obtained. Also in this interspecific combination, the character pairs of brown *vs.* white glumes and black or brown *vs.* white awns each depended on complementary genes, with the dark coloration dominant. Segregation with respect to keel development and solid *vs.* hollow culms was affected by linkage of the genes involved. Barbed *vs.* smooth awns in *T. durum* 'Smooth-awned' x *T. vulgare* 'Converse' was controlled by a single pair of genes, with the barbed condition dominant. Except for the linkage observed between awn colour and glume pubescence in *T. durum* 'Major' x *T. vulgare* 'C518', the characters studied were independently inherited.

2452 Fukasawa, H. & Mito, K.
Paper chromatographic analysis of chlorophylls in cytoplasmic male-sterile wheat.
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1957 : No. 8 : 4–8.

As already reported [cf. XXVII, 367], male-sterile *Triticum durum* plants containing *Aegilops ovata* cytoplasm show variegation during winter. According to the results of paper-chromatographic examination, the contents of chlorophyll a and b in the leaves of such plants were respectively reduced to 66–76% and 53–71% of those of normal green plants. These values were in good agreement with those obtained by means of a photoelectric colorimeter.

2453 Tabushi, J.
(Chromosome aberrations in the progeny of the synthesized hexaploid wheat ABD No. 4).
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1957 : No. 8 : 83–87. [Japanese].

Meiosis in selected plants in the F_6–F_9 of a cross between *Triticum persicum* var. *stramineum* and *Aegilops squarrosa* is described. The F_6 plant formed up to 21 bivalents at meiosis. In the succeeding generations, 21_{II} was the modal configuration but aneuploids ($2n = 41$

or 43) occurred fairly frequently, probably as a consequence of univalent formation.

2454 Fukasawa, H.
Studies on restoration and substitution of nucleus (genome) in *Aegilotricum*, VII. Curious abnormalities of stomata appearing in the leaves of male-sterile *durum* plants.
Cytologia, Tokyo 1958 : **23** : 128–42.

A chlorophyll variegation appears during winter in the leaves of ♂-sterile plants containing the genome of *Triticum durum* and the cytoplasm of *Aegilops ovata* [cf. XXVII, 367]. The abnormal stomata found in such leaves were classified into six types according to (1) the degree of differentiation and malformation of the guard cells and their nuclei and (2) the degree of malformation or deficiency of the subsidiary cells. Stomatal frequency per unit area of leaf was not altered in the variegated leaves but the distribution differed from that in ordinary *T. durum*, the average number of stomata per unit length being decreased in the longitudinal direction and increased in the transverse direction. The abnormal stomata did not however occur at random but to some extent serially, more series with such stomata being found in the longitudinal than in the transverse direction. Measurements on guard and subsidiary cells indicated that stomatal abnormality was in general associated with decreases in cell and nucleus length. Cell length was correlated with nucleus length with a coefficient of + 0·9137 in the guard cells. The frequency of abnormal stomata was much higher in the variegated portion than in the green area of the same leaf. Abnormal stomata were virtually absent from flag leaves. It is suggested that an unknown cytoplasmic condition is responsible for abnormal metabolism in the leaves during winter, which leads on the one hand to irregular development of the stomata and on the other to the formation of abnormal chloroplasts.

2455 Nakajima, G.
(Cytogenetical studies of trigeneric hybrids. I. External morphology and meiosis in the pollen mother cells of TdicHRF$_1$, TperHRF$_1$ and TturHRF$_1$).
Idengaku Zasshi/Jap. J. Genet. 1958 : **33** : 120–26. [Japanese].

Descriptions are given of the external morphology and meiotic behaviour of (*Triticum dicoccum* x *Haynaldia villosa*) x *Secale cereale*, (*T. persicum* x *H. villosa*) x *S. cereale* and (*T. turgidum* x *H. villosa*) x *S. cereale*. The modal bivalent frequency of the first cross was $1–2_{II}$ and of the second 0_{II}. Ring-shaped bivalents occurred frequently in the first cross and rarely in the second. Bivalent formation may be due either to autosyndesis or to translocation.

2456 Nakajima, G.
[Cytogenetical studies of the triple hybrid (*Triticum turgidum* x *Secale cereale*) x *T. vulgare*. IV. Meiosis in the pollen mother cells of the F$_2$ plants].
Idengaku Zasshi/Jap. J. Genet. 1958 : **33** : 146–54. [Japanese].

An earlier paper [XXIV, 201] dealt with the range in chromosome number of the F$_2$ of the above cross. In the present paper, meiosis is described in 35 F$_2$ plants. The bivalent frequency was 14_{II} where $2n = 28–32$, 15_{II} where $2n = 33–37$, $15_{II}–19_{II}$ where $2n = 38–44$ and $17_{II}–21_{II}$ where $2n = 45–50$. Data are also provided on frequency of laggards and micronuclei and tetrad configuration.

2457 **Experimental grass-wheat hybrids.**
Agric. Res., Wash. 1958 : **7** : No. 5 : 8–9.

Perennial hybrids developed at the Agricultural Experiment Station, Davis, Calif., by back crossing wheat-*Agropyron* hybrids to spring wheat and intercrossing the progeny have a life of about four years, with progressively smaller yields after the first year. In recent tests, two perennial selections yielded as well as the best local wheats in the first crop. When problems of weed control and soil fertilization after the first year have been solved, it is hoped that higher yields may be obtained in the second and subsequent years. Combined with the desirable characters of disease and insect resistance, drought tolerance and perennial habit, undesirable features such as low test weight, fragility of the rachis and sterility are found in some selections. It is stressed that a considerable amount of further breeding is required to eliminate such defects. It is noted that high-protein flour with good baking quality was produced from one selection.

2458 Fujii, T.
Mutations in einkorn wheat induced by X-rays, III. Double recessive plants in a cross between basi-viridis II and chlorina.
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1957 : No. 8 : 33–36.

[Cf. XXVIII, 33].

2459 Filippenko, I. A.
(The inheritance of some physiological changes in wheat induced by 2,4-D).
Fiz. Rasten. (Phys. Pl.) 1958 : **5** : 453–55. [Russian].

The study of the effect of 2,4-D upon form development in the spring wheat Moskovka 48 [wheat from Moscow 48] has been continued [cf. XXVII, 2800] and extended by including other wheats and the rye Vjatka. Morphological changes in this material include several in addition to those described in the previous report. The following changes were heritable. Moscow 48 gave rise to an awnless form which bred true for this character. Spraying the winter wheat Moscow 2460 with the chemical on 14 May accelerated the maturity of the progeny, while spraying the same variety on 8 June gave a progeny which ripened later than usual.

2460 Ljaščenko, I. F.
(Directed change of nature in wheat and barley).
Bot. Ž. (Bot. J.), Moskva 1958 : **43** : 1293–303. [Russian].

It is pointed out that most so-called pure lines are heterogeneous in respect of many physiological characters. Some Kirgizian winter wheats when sown in spring at Rostov in 1944 contained a certain number of plants that came into ear. The grain of these plants when sown separately in spring the following year gave progenies that revealed great diversity in development and yield. Half the grain from each plant was sown in autumn 1945 and the other half in spring 1946. The number of plants that survived the winter varied in different families, some of which had no survivors. Some lines matured at the same time as the original line but most were 4–12 days later. Variation was also observed in ear colour.

In the spring sowings most of the lines produced normal ears and only very few failed to ear at all. Selection for spring habit in the previous generation had thus been highly effective. Some lines that failed to survive the winter also failed to ear in spring sowings and are classed as winter forms deficient in hardiness. Many lines segregated for time of maturity, though most plants were later than the standard spring wheats.

Spring sowing of the Armenian winter wheat Armadanicum also gave a number of plants that eared, the progeny of which behaved as alternative wheats, giving mature ears in both spring and winter sowings; the range of variation was rather less than in the Kirgizian wheats. After 7 years' spring sowing the segregates from the Kirgizian wheats lost their capacity to survive when winter sown. Similar alterations were observed in the Armenian wheat but to a lesser degree, as these segregates had not completely lost their winter hardiness after 7 generations. After 7 winter sowings the Kirgizian segregates behaved as winter wheats and very few eared when spring sown. Most segregates from the Armenian wheat however still eared regularly when spring sown after 7 years of winter sowing. This wheat is therefore regarded as more conservative.

A certain number of plants of Kooperatorka also eared when this wheat was spring sown in 1949. Grain from these ears was sown half in autumn and half in spring. In autumn sowings the plants survived the winter and in spring sowings all plants came into ear; their progeny also eared the following year in spring sowings. These lines retained their alternative habit after a series of years of both spring and winter sowings.

During ten years of extensive observation on this material no case of conversion into rye was observed.

In the barley collection of the Institute of Plant Industry several varieties produced occasional ears when sown in spring. By selection from these ears it was possible in 2–3 years to produce lines that gave 100% earing in spring sowings.

In the light of these results the author concludes that most of the conversions reported in the literature are the result of selection of changed forms already existing in the population.

2461 Stoletov, V. N.
O citlivých obdobích ve vývoji rostlin. **(Sensitive periods in the development of the plant).**
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba 1959 : **31** : 205–14.

Stoletov, V. N.
O biologických vztazích v procesu oplození a o možnostech jejich aktivace. **(Biological interactions in the fertilization process and the possibilities of activating them).**
Ibid. 1959 : **31** : 215–24.

Both papers form part of an address delivered to the Czechoslovak Academy of Agricultural Sciences in 1958 and give accounts of Mičurinist

experiments on vernalization of wheats or changing spring-wheat varieties and hybrids into winter wheats and *vice versa*.

2462 **Varieties of winter wheats.**
Fmrs'. Leafl. nat. Inst. agric. Bot. 1959 : No. 8 : unpaginated.

Varieties of spring wheats.
Ibid. 1959 : No. 9 : unpaginated.
Information is given on varieties recommended as the result of trials carried out by the National Institute of Agricultural Botany, Cambridge, England.

2463 **Carme 23.**
Sementi elette 1959 : **5** : No. 1 : p. 59.
The wheat described is a hybrid produced by G. Jacometti from (Bianco piemontese [Piedmont White] x Villa Glori) x Carme Jacometti. It is a bread wheat resistant to lodging and rusts and in the Po valley in 1957–58 gave a mean grain yield of 45 c. per ha.

2464 Bonfiglioli, O.
Le razze italiane di grano in Jugoslavia. (**Italian wheat varieties in Yugoslavia**).
Sementi elette 1959 : **5** : No. 1 : 10–27.
Data presented for the season 1957–58 show that several Italian varieties were among those that survived the winter most successfully in various parts of Yugoslavia and most of them excelled the standard local varieties in grain yield. Thus under conditions where the local U_1 yielded 36·32 c. per ha., S. Pastore gave 51·60 c. per ha., Abbondanza [Abundance] gave 51·07 c. and Fortunato [Fortunate] 50·78 c. The record yield, of 89·53 c. per ha., was obtained with Fortunato. The greatest resistance to *Puccinia rubigo-vera* was shown by the varieties Elia, Produttore [Yielder], S13, Mara, Freccia [Arrow] and Quaderna; Elia and Produttore were also resistant to *P. graminis*.

2465 Luk'janenko, P. P.
(**Change the method of renewal and replacement of varieties of cereals**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 4 : 18–21. [Russian].
Mention is made of the winter wheat Bezostaja 4/1 [Awnless 4/1] selected from Bezostaja 4 at Krasnodar. It is distinguished from the initial form mainly by higher yield and greater plasticity.

2466 Wallin, J.
Kokemuksia Svenno-kevätvehnän viljelystä Suomessa. (**On the cultivation of Svenno spring wheat in Finland**).
Koetoiminta ja Käytäntö 1958 : **15** : p. 13.
Svenno gives an 11% higher yield than Timantti [Diamond] in southern Finland. It is somewhat later ripening than the latter, but has good strength of straw. On the acid soils of southwest Finland its yield is about 7% less than Timantti.

2467 Fajersson, F.
Weibulls Starke höstvete. (**The Weibull winter wheat Starke**).
Weibulls Årsb. Växtföräd. Växtodling 1959 : **54** : 3–10.
Starke, a new variety for southern Sweden developed from a cross between W11556, derived from Eroica x Virtus, and W11376, which is a sister variety of Banco, has yielded appreciably more than standard varieties in Götaland, is more winter hardy than Eroica II, has stronger straw than any other winter wheat grown in Sweden, is resistant to shedding, appears to equal Banco in earliness, resists sprouting in the ear, mildew and *Fusarium* and appears to be immune from loose smut. The bushel weight of the grain and the baking quality equal those of Banco and Eroica and the protein content is intermediate between the values for these two varieties.

2468 Gozhita Skander
(**The wheats of Albania**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 5 : 68–73. [Russian].
Botanical, morphological and economic characteristics of the principal varieties and forms are described. Some are local populations but the best varieties are introductions from Italy such as the soft wheat Tevere and the hard wheat Senatore Cappelli. The *Triticum vulgare* varieties are hardy, resistant to diseases and adapted to cultivation on elevated ground or poor or waterlogged soils. Some varieties have a habit suitable for combine harvesting. The *T. durum* varieties are mainly interesting for large vitreous or semivitreous grain and resistance to drought, shedding and rust. The best macaroni wheat is the Albanian *T. turgidum* variety Mavrogan, which is also superior to all others in baking quality. It has vitreous grain with 14%

protein. Mention is made of rare botanical varieties found as admixtures in the various cultivars. They include vars. *introitum* and *pseudolutescens* of *T. vulgare*, var. *horano-alexandrianum* of *T. durum* and var. *miscibile* of *T. turgidum*.

2469 Ionescu-Şişeşti, G., Mihalca, V. & Boldea, E.
Diferite linii de grîu de toamnă la care s-a aplicat o agrotehnică superioară. (**Different lines of winter wheat to which superior agrotechnical measures have been applied**).
An. Lucrăr. şti. Inst. agron. N. Bălcescu Bucureşti 1957 : 5–18.

Three line selections, 31, 41 and 185, of the Rumanian variety A15 are described. Each is adapted to a particular type of crop rotation.

2470 Uhanova, O. I.
(**New wheat varieties for the regions of Kirgizia and Tajikistan**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 4 : 59–61. [Russian].

Descriptions are given of Batkan Krasnaja [Red Batkan], Oš, Surhak Jubilejnyj [Jubilee Red] and Horanka 46, the first two developed in Kirgizia and the others in Tajikistan. Horanka 46 belongs to var. *horanoleucurum* of *Triticum durum* and was selected from a Palestinian form. It is a productive alternative wheat, with large vitreous grain rich in gluten and makes fine macaroni. The others are winter wheats with high yields, Surhak Jubilejnyj being interesting for its earliness and the other two for large grain, resistance to drought and lodging and good baking and milling properties.

2471 Pruckov, F. M.
(**Wheat breeding in China**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 4 : 67–73. [Russian].

Breeding work with wheat in China is discussed and tabulated information on the origin and biological and agronomic characters of 15 recent varieties is presented. Most are distinguished by high yields and resistance to diseases and some represent valuable breeding material on account of their earliness. Two varieties are introductions from the USA and one from the USSR.

2472 Petrov, I. P.
(**Expand the area under the valuable spring wheat variety Caesium 94**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 5 : 61–62. [Russian].

Caesium 94, obtained from crossing the strong-floured spring bread wheat Caesium 111 with *Triticum dicoccum* at Omsk, equals its bread-wheat parent in quality and surpasses it in resistance to lodging, bunt and smut. In trials at Omsk it outyielded Caesium 111 by 30%. In 1956 the variety was made a standard for the steppe zone of the province of Omsk and it is urged that it should be introduced in other districts of Siberia and Kazahstan.

2473 Unrau, J.
Kenhi, a new soft white spring wheat.
Pr. Bull. Alberta Univ. Ext. Dep. 1959 : **44** : 2–3.

Kenhi, developed by back crossing an F_3 selection of Kenya Farmer x Lemhi to the latter parent, is recommended for irrigated areas in southern Alberta. Resistant to leaf rust and to race 15B and other virulent races of stem rust, it is recommended as a substitute for the rust-susceptible variety Lemhi. Kenhi is also superior to Lemhi in having higher yielding capacity, shorter and slightly stronger straw and somewhat earlier maturity.

2474 Scarascia, G. T.
Modificazioni cromosomiche strutturali causate dalla irradiazione neutronica in semi di *Triticum durum* Desf. (**Structural chromosomal modifications caused by neutron irradiation in seeds of *T. durum* Desf.**).
Nuovo G. bot. ital. 1957 : **64** : 727–31.

Chromosomal aberrations induced in three varieties by four different neutron doses are described. The principal aberrations produced were B″ breaks; these increased linearly with dose, the three varieties not differing significantly in their frequencies.

2475 Larson, R. I.
Cytogenetics of solid stem in common wheat. I. Monosomic F_2 analysis of the variety S-615.
Canad. J. Bot. 1959 : **37** : 135–56.

F_2 monosomic lines of Chinese Spring (hollow stemmed) x S–615 (solid stemmed) were compared with normal F_2 lines with respect to stem solidity, with the ultimate aim of securing information for use in breeding for resistance to *Cephus cinctus*. A solidity index was determined for each plant by totalling index numbers

(ranging from 1 for thin-walled and hollow to 5 for completely solid) assigned to cross sections of the culm in seven specified positions. As both normal and monosomic lines showed a continuous distribution of values for this index, the factorial analysis was not entirely reliable. Data on normal F_2 lines gave an estimated difference between the parents of at least four major genes. Quantitative disparities between monosomic and normal lines indicated that chromosomes II, XIII and XX, comprising homeologous group 2, tended to make the culm hollow. Chromosomes XIX and XXI also had the effect of reducing pith development. As shown by the trihybrid ratio obtained in the case of mono-XIII, XIII in Chinese Spring had a gene for hollow culm, which had no active allele in S–615. Chromosomes XIX, XX and XXI, belonging to genome D, were effective in both S–615 and Chinese Spring. Data on II were inconclusive. Chromosomes of S–615 bearing genes for solid stem were not identified by this method; such genes are probably recessive and F_2 monosomic analysis does not reveal recessives present only in the variety being tested. Although the effect of loss of a chromosome belonging to homeologous group 2 was quantitatively different according to the chromosome in question and the year, the pith patterns of monosomics II, XIII and XX were essentially similar. Mono-XVIII, tested in crosses with several varieties, also had a characteristic pith pattern, the culm tending to be slightly more solid in the top internode and less solid in the lower internodes than in the corresponding normal hybrid. Stem solidity in mono-XIII was associated with the hooded awns of Chinese Spring, known to be controlled by a gene on VIII. In the normal population but not in mono-XIII, stem solidity was associated with the lax ear of S–615.

2476 Heslot, H. & Ferrary, R.
Obtention expérimentale d'un autotétraploïde aberrant (*Triticum timonovum*) à partir de *Triticum timopheevi* Zhuk. [**Experimental production of an aberrant autotetraploid (*T. timonovum*) from *T. timopheevi* Zhuk**].
CR Acad. Sci., Paris 1959 : **248** : 452–55.

By means of colchicine treatment of grains of *T. timopheevi*, tetraploid material ($2n = 56$) differing from the initial species in the form and black pigmentation of the ear, in its greater hairiness and in its larger grains has been obtained. The tetraploid has good fertility and is assigned to the new species *T. timonovum*.

2477 Fedorov, A. K.
(The question of the nature of first generation hybrids between spring, alternative and winter varieties of plants).
Dokl. Akad. Nauk. SSSR (Proc. Acad. Sci. USSR) 1958 : **120** : No. 3 : 654–56. [Russian].

Observations on F_1 hybrids of spring wheats x winter wheats and spring wheats x alternative wheats at the Institute of Genetics of the USSR Academy of Sciences showed that these had a mode of development analogous to that of alternative wheats. This was shown in the retarded differentiation of the growing points, reduced growth rate, semiprostrate habit and improved overwintering ability after autumn sowing. The hybrids also resembled alternative wheats in their response to vernalization.

2478 Ljaščenko, I. F., Sevast'janov, V. I. & Sirica, A. I.
(The dynamics of carbohydrates in leaves of alternative wheats during the process of their directed training).
Fiz. Rasten. (Phys. Pl.) 1958 : **5** : 350–53. [Russian].

The amounts and kinds of sugars synthesized by alternative wheats selected from the winter wheats Hamadanicum, Erythrospermum 3 and Erythrospermum 9 at Rostov and grown in autumn or spring sowings for 10 years, did not appreciably differ from those synthesized by their winter parent variety. Forms grown as winter crops showed a slight increase of sugars by comparison with the initial winter varieties. Forms grown as spring wheats had a higher glucose content than those grown as winter wheats or than true winter wheats, but, unlike these, with the onset of cold weather they showed a decrease in glucose. These findings are thought to counter the view that alternative wheats are spring varieties characterized by improved hardiness.

2479 Omarov, D. S.
(Some characteristics of form development in conversions of spring into winter forms).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. **4** : 13–17. [Russian].

The mode of development of two spring wheats, one belonging to var. *milturum* and another to var. *lutescens*, when grown as winter crops at Puškin for several generations, is described. The winter forms arose in most cases, suddenly, after the third or fourth sowing as a winter

crop and more winter types occurred in the spring wheats sown on 5 September than on 10 October. Some winter forms were of the same botanical variety as the initial spring variety, others were of a different variety. Intervarietal conversion was also observed in plant families which retained their spring habit. The least stable morphological characteristic in the plants undergoing conversion was awning, followed by ear colour, grain colour, pubescence of glumes, form of ear and grain shape. Most of the new winter forms were constant morphogically. They had growth periods 4–6 days shorter than the initial spring wheats, those derived from the earlier spring variety being also correspondingly earlier. In the course of changing spring into winter wheats, frequent instances were encountered in which plants with recessive characters gave rise to offspring with the corresponding dominant characters. For instance *lutescens* forms derived from var. *milturum* gave rise to some red-eared *milturum* and *ferrugineum* types and *ferrugineum* forms of the same origin gave rise to awnless *milturum* types. Families have been selected for earliness, winter hardiness, tall straw, compact ears and large grain. Some of these are winter wheats, others semiwinter or spring wheats.

2480 Hiivola, S.-L.
Kokemuksia kevätvehnän leikkuupuinnista. (Observations on combine harvesting of spring wheat varieties).
Maatalous ja Koetoiminta 1958 : **12** : 82–91.

A number of spring wheat varieties are compared for moisture content of the grain and the occurrence of sprouting in the ear when the crop is dried on poles or combine harvested. Variety Timantti [Diamond] gives good quality grain provided it is not combine harvested while too moist. Germination in the ear is also low in this variety.

2481 Porter, K. B.
The inheritance of shattering in wheat.
Agron. J. 1959 : **51** : 173–77.

A detailed account is presented of investigations which have already been briefly reported [XXVIII, 1337].

2482 Lebedev, N. V.
(Breeding wheat-*Agropyron* hybrids of a winter type with branching ears).
Priroda (Nature), Leningrad 1959 : No. 2 : 98–100. [Russian].

Two new forms of wheat were selected from F_5 hybrids of *Triticum vulgare* and *A. glaucum*. Both are winter forms with 42 chromosomes and branching ears, one having red ear and grain and the other a white ear and red grain. The latter, designated *T. vulgare* var. *alboramosum*, was improved by selection of productive branching ears on plants grown on rich soil. In 1955 it yielded 50 c. per ha. without lodging. Various experiments designed to study the inheritance of the branching habit are described. They indicate that this character is heritable, provided the plants are grown on rich soil, and that bagging or open pollination does not alter the percentage of plants having branching ears.

2483 Hurd, E. A.
Inheritance of blue kernel colour in wheat.
Canad. J. Pl. Sci. 1959 : **39** : 1–8.

The inheritance of blue colour of the endosperm was studied in crosses of Blue 1 (*Agropyron elongatum* x *Triticum vulgare*) with Rescue and Lemhi, these parents having blue, red and white kernels respectively. Blue colour depended on two dominant complementary genes. Two complications enter into an analysis of this kind: (1) segregation ratios are determined by a double allotment of genes from the maternal parent and by the effect of xenia on the endosperm cells, and (2) the labile nature of the blue pigment under different environmental conditions tends to mask the mode of inheritance. It was found that an endosperm of the constitution *AABB|ab*, in which *A* and *B* represent the dominant genes for blue colour, was blue under all growing conditions, whereas with only two dominants, the endosperm could be either blue or nonblue, depending upon the environment. Variability in light and moisture conditions appeared to account for the inconsistency in the expression of blue colour as the result of the environment.

2484 Miyamoto, T. & Everson, E. H.
Biochemical and physiological studies of wheat seed pigmentation.
Agron. J. 1958 : **50** : 733–34.

Analysis of the pericarp and seed coat from kernels of dark red, light red and white wheats at the dough stage showed that the quantity of catechin and catechin tannin in the seed coat varies directly with the degree of pigmentation of the mature kernels. The main pigment in the seed coat of the ripe kernels may therefore be phlobaphene, whose precursors are catechin and catechin tannin. The pericarp contained only traces of the two catechins. When seeds of the dark red wheat Cheyenne were germinated in various concentrations of catechin

tannin from green tea leaves, it was found that the water uptake was not reduced if the concentration was below 0·58% and that inhibition of germination was marked at a concentration of 0·06% and above. The possible relationship of pigmentation to dormancy is discussed.

2485 FAJERSSON, F.
Bergs Methode zur Bestimmung von Vermahlungseigenschaften an einzelnen Weizenpflanzen. (Berg's method for determining milling qualities in individual wheat plants).
Züchter 1958 : **28** : 329–30.

In the method described 10 g. of wheat of normal water content are ground to a meal and then sifted for 10 min. using a sieving machine. Three bolting cloths, 9, 12 and 15, are used, these having mesh widths of 150, 105 and 75 μ respectively. The weight of flour under cloth 15, the Berg number, is a useful measure of the grittiness of the flour; varieties with a low Berg number have better grittiness than those with higher numbers. This method has been used extensively at Weibullsholm, Sweden.

2486 YAMASHITA, K., TANAKA, M. & KOYAMA, M.
Studies on the flour quality in *Triticum* and *Aegilops*.
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1957 : No. 8 : 20–26.

Flour samples from *T. monococcum, T. dicoccum, T. vulgare, T. spelta, T. sphaerococcum, Ae. squarrosa, Ae. ventricosa, Ae. crassa, Ae. cylindrica* and two synthesized 6*x* wheats were analysed with respect to protein, ash, moisture and gluten contents, absorption and loaf volume. Flour from the two strains of *Ae. squarrosa* tested was high in protein (15·83 and 15·88%), ash (1·05 and 0·96%) and gluten (wet gluten, 63·9 and 64·5%, and dry gluten, 27·1 and 27·3%). The loaf made with flour of this species, when blended with Argentine wheat so as to contain 11% protein, was as soft as that from *T. vulgare* flour and its taste is described as good. [Cf. XXVII, 414].

2487 YAMAZAKI, W. T.
Flour granularity and cookie quality. I. Effect of wheat variety on sieve fraction properties.
Cereal Chem. 1959 : **36** : 42–51.

Study of the coarse and fine fractions obtained by sifting straight-grade flours from several hard and soft wheats over a 325-mesh sieve indicated a separation not only of the particles by size but also with respect to chemical composition and quality for baking "sugar-snap" biscuits as evaluated in terms of spread. In the harder varieties, the protein contents of the two fractions did not differ appreciably and the ash contents of the fine fractions were higher than those of the coarse. The two fractions were equally poor in biscuit-making quality. The fine flours from the soft-wheat varieties, on the other hand, were lower in protein and ash contents and produced larger biscuits than the coarse fractions. In each variety, blends of the coarse and fine fractions showed an "interaction effect" in that they baked into biscuits larger than would be expected from a calculation of the weighted mean diameters for the fractions.

2488 YAMAZAKI, W. T.
The application of heat in the testing of flours for cookie quality.
Cereal. Chem. 1959 : **36** : 59–69.

Four procedures were employed in evaluating straight-grade, unbleached flours of seven wheat varieties: (1) the heating mixograph test, using a conventional National-Swanson working mixograph unit modified so as to reduce the speed of the mixer; (2) determination of the alkaline water retention capacity at various temperatures by preheating a sodium bicarbonate solution prior to its addition to the flour and by maintaining the suspension at the desired temperature during hydration; (3) use of the Brabender viscograph; and (4) oven baking of biscuits, data being obtained on the diameter, weight loss and internal dough temperature of the partially baked doughs. The results from the first three tests indicated that flours giving poorer "sugar-snap" biscuits, as shown by smaller diameters, underwent increases in viscosity earlier and at lower temperatures. This behaviour was not attributable to varietal differences in rates of heat penetration or of losses in volatile ingredients.

2489 FADRHONS, J.
Šlechtění pšenice na jakost. (Breeding wheat for quality).
Sborn. čsl. Acad. zeměd. Věd: Řada rostlinńa Výroba 1958 : **31** : 931–42.

An account of breeding spring and winter wheats combining high yield with good baking quality at Semčice is given. The resulting varieties include the new spring wheat Dobrovice 3 (Hodonínská Osinatá [Hodonínská Awned] x Koga), equal in quality to the standard variety Podbořanka but with a 14% higher grain yield, and a new winter wheat Čeič (Hodonínská Osinatá x Carstens V x Koga), which outyields the winter standard Chlumecká 12 by 4–5% and has better baking properties.

2490 Durham, R. K.
Soft wheat quality: the trade viewpoint.
Cereal Sci. today 1958 : **3** : 268–69.
The requirements of the American milling and baking industries with respect to soft-wheat quality are discussed, together with the probable repercussions of the recently developed process of turbo-milling upon breeders' aims. This method involves reprocessing of flour milled in the ordinary way, so that the particle size is first reduced by attrition and the particles are then separated into fractions according to size, shape and density.

2491 Harris, R. H. & Sibbitt, L. D.
The macaroni cooking quality of North Dakota durum wheat.
Bi-m. Bull. N. Dak. agric. Exp. Sta. 1958 : **20** : No. 6 : 4–11.
An analysis was made of the new varieties Langdon, Ramsey, Yuma and Towner, which are resistant to the 15B stem-rust complex, the standards Mindum and Sentry, which are satisfactory in quality when not attacked by stem rust, and the experimental hybrid selections LD392, LD393, LD390 and LD389. The properties studied were protein content of the grain, macaroni colour, dough-mixing characteristics, residue in the cooking water, cooked weight and tenderness. The most important varietal differences were expressed in cooked weight and tenderness, Langdon, Ramsey and Towner being closer to the standards in these respects than Yuma. Preliminary results for the unnamed hybrids showed that LD393 and LD389 were satisfactory in macaroni cooking quality.

2492 Uspenskij, N. A., Gaponenkov, T. K., Vasil'eva, E. K. & Porojskaja, S. M.
(Vegetative hybridization as a method of developing new wheat varieties).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 5 : 12–14. [Russian].
The vegetative hybrid of hard wheat Melanopus 69/*Triticum persicum* from the Voronež Agricultural Institute outyields Melanopus 69 by 5·5 c. per ha., has larger grain, higher contents of protein and gluten than Melanopus 69 and surpasses it, and also Narodnaja [People's], in baking quality. The sexual hybrid involving the same parents is also more productive than Melanopus 69 but yields less than the vegetative hybrid and is inferior to it also in other economic properties. Mention is made of promising sexual hybrids of *T. durum* x *T. polonicum*, also bred at Voronež.

2493 Kökény, B.
Ricerche sul metodo di valutazione della qualità del frumento secondo Zeleny—Confronto fra i metodi Pelshenke e Zeleny. **(Investigations on the Zeleny method of estimating wheat quality; comparison of the Zeleny and Pelshenke methods).**
Sementi elette 1959 : **5** : No. 1 : 28–42.
After a description of the two methods and a review of some of the literature dealing with their use, an experiment is described in which flour from 26 wheat varieties was sieved and separated into two portions, that passing through a No. 8 sieve being classed as flour and used for estimation by the Zeleny method, with slight modifications, and that passing through No. 40 but not No. 8 being classed as meal and used for the Pelshenke determination. The two sets of results agreed fairly well, the correlation being $r = +0{\cdot}686 \pm 0{\cdot}103$. The Zeleny method, being simpler and quicker, giving more uniform results and requiring smaller amounts of flour, is therefore recommended for classifying not only wheats of high quality but the early generations of breeding material.

2494 Harris, R. H. & Sibbitt, L. D.
New techniques for preliminary screening wheat hybrids for quality.
Bakers' Dig. 1957 : **31** : No. 4 : 68–73.
High positive correlations were obtained between wheat meal volume and flour volume and high negative correlations between wheat meal volume and flour yield and between flour volume and flour yield, showing that screening for milling quality could be carried out by measuring the specific volume of the whole wheat meal without milling. Whole wheat mixogram values were less useful for screening samples for dough mixing quality.

2495 Heslot, H.
Triticum hispahanicum: une nouvelle espèce de blé cultivé originaire d'Iran. **(*T. hispahanicum*: a new species of cultivated wheat originating from Iran).**
CR Acad. Sci., Paris 1958 : **247** : 2477–79.
The above new species ($2n = 28$) is described. It is an alternative wheat and is grown under irrigated conditions in a restricted area in Vazrak in the province of Isfahan at an altitude of 2000–2500 m. Two varieties, *uniaristatum* and *biaristatum*, are distinguished.

2496 Campbell, W. P.
A cause of pink seeds in wheat.
Plant Dis. Reptr. 1958 : **42** : p. 1272.
A study of the causes of pink seeds in wheat which is combine harvested was made by harvesting samples of a number of varieties at weekly intervals in August. The cause appears to be the harvesting of immature seeds and the phenomenon is most noticeable in varieties Lemhi and Kenya Farmer.

2497 Ota, K. & Yasue, T.
(**Studies on salt injury to agricultural crops. XI. Intervarietal differences in the salt resistance of wheat seedlings**).
Gifu Daigaku Nogakubu Kenkyu Hokoku/Res. Bull. Fac. Agric. Gifu Univ. 1957 : No. 8 : 14–22. [Japanese].
The reactions of 19 Japanese varieties to germination in Petri dishes with 0·2–1% NaCl were ascertained. Intervarietal differences in degree of injury were noted, the variety least damaged being Tokai 57.

2498 Pugnat, C. & Stroun, M.
Étude sur la résistance au froid des blés.
(**A study on the resistance of wheats to cold**).
Landw. Jb. Schweiz. 1958 : **72** : 417–23; also Publ. Sta. féd. essais agric. Lausanne 1958 : No. 561.
Several winter and spring wheats and barleys were sown during the summer and subjected to photoperiods of various length. In each case the number of days required for the ear primordia to reach a certain stage of development was determined, this period being the photostage. Varieties showed marked differences in their photostage requirements. Lengthening the photoperiod accelerated the development of the ears; the sensitivity threshold, which is the length of photoperiod at which this acceleration begins, also differed markedly between varieties. A sensitivity quotient (Q) was determined for the wheat varieties: $Q =$

$$\frac{\text{length of the photostage with a short photoperiod } (9\frac{1}{2} \text{ hr.})}{\text{length of the photostage with a long photoperiod } (15 \text{ hr.})}.$$

It is stated that the duration of the photostage provides information on the cold resistance of a variety sown during a time of short photoperiod. The sensitivity quotient and sensitivity threshold indicate the degree of cold resistance of winter forms after an early sowing and the reaction to a spring frost after favourable winter conditions. It is thought that investigations on the photostage of cereals provides a practical method of determining frost resistance.

2499 Kuspira, J. & Unrau, J.
Determination of the number and dominance relationships of genes on substituted chromosomes in common wheat, *Triticum aestivum* L.
Canad. J. Pl. Sci. 1958 : **38** : 199–205.
A method which permits the determination of number and dominance relationships of genes on a substituted chromosome governing a particular character is described and demonstrated by results of a study of awning, culm colour and reaction to pseudo - black chaff in seven substitution lines of Chinese Spring wheat, each differing from Chinese Spring in one or more genes governing these characters. Recessive genes for apical awning were found on chromosome III of Thatcher and Timstein and on IV, XII and XXI of Thatcher. Hope carries a dominant gene for purple culm colour on chromosome VII and a recessive one for pseudo - black chaff susceptibility on chromosome III.

2500 Miladinović, N. & Spasić, M.
Pojava *Ustilago tritici* (Pers.) Jans. u vezi sa različitim rokovima setve sorata ozime pšenice. [**The occurrence of *Ustilago tritici* (Pers.) Jans. in connexion with different sowing dates of winter-wheat varieties**].
Zaštita Bilja 1957 : No. 44 : 63–67.
Late sowing decreased the incidence of loose smut but was also responsible for appreciable reduction in the yields of wheats at Zaječar. Varietal differences in resistance were observed, Thatcher being the most resistant. Breeding for resistance, employing the above variety for crossing with others, is recommended as a method for controlling loose smut.

2501 Popp, W.
A new approach to the embryo test for predicting loose smut of wheat in adult plants.
Phytopathology 1959 : **49** : 75–77.
In a new method of embryo examination, the presence of loose smut (*Ustilago tritici*) mycelium in the various tissues of mature wheat embryos was compared with the amount of smut that developed in adult plants grown from the same seed lot. The embryos are classified according to their reaction to the fungus as follows: (1) resistance of the entire embryo: (2) susceptibility

of all but the plumular bud; and (3) susceptibility of all tissues including the plumular bud. It is concluded that only infection of plumular-bud tissue is correlated with infection in growing plants, and this type of embryo response gives a reasonably accurate prediction of the percentage of smut infection in adult plants.

2502 Kanzler, K.
Untersuchungen über die Verbreitung des Zwergbrandes (*Tilletia contraversa* Kühn) in Bayern und Bekämpfungsmassnahmen. [**Investigations on the distribution of dwarf bunt (*T. contraversa* Kühn) in Bavaria and control measures**].
Bayer. Landw. Jb. 1958 : **35** : 454–92.
This account includes a brief review of literature on breeding for resistance to dwarf bunt in wheat. In tests held in Germany, Hohenheimer Stamm 29 [Hohenheim race 29] and Stamm K43/3, also known as Kienle Karat [Kienle Carat], have shown good resistance.

2503 Petralia, L.
I frumenti teneri e i frumenti duri di fronte alle infezioni artificiali da "carie" (*Tilletia* spp.) negli ambienti pedoclimatici della Sicilia. Nota preliminare. [**Reactions of soft and hard wheats to artificial infections by smut (*Tilletia* spp.) in the pedoclimatic environments of Sicily. A preliminary note**].
Ann. Sper. agr. 1958 : **12** : 1557–68.
Observations were made on four cultivars of *Triticum aestivum* and four of *T. durum*, which are described. On being infected artificially with a mixed inoculum of *T. caries* and *T. foetens*, all proved susceptible, though in different degrees. The least susceptible were *T. durum* 'Garigliano', 'Capeiti 8', 'Azizia x Cappelli 92 G', and 'Russello SG 7' and *T. aestivum* 'Casale 37' and 'Ariana 8/H', the most susceptible being *T. aestivum* 'M5' and 'Florau'.

2504 Jovićević, B.
Otpornost nekih sorata pšenice prema glavnici. (**The resistance of some wheat varieties to bunt**).
Zaštita Bilja 1957 : No. 44 : 83–88.
Domaća Vrela [Local Vrela] was the most resistant variety among those tested under artificial infection conditions at Peć. Bánkút 1205 and Rumska Crvenka [Ruma Red] were also fairly resistant.

2505 Sandu-Ville, C., Lazăr, A. & Hatmanu, M.
Rezistența la infecția cu mălură a unui sortiment de grîne de primăvară. (**Resistance to infection by bunt in a collection of spring wheats**).
An. Lucrăr. ști. Inst. agron. Ion Ionescu de la Brad Iași 1957 : 99–106.
Thirty-three locally grown varieties were artificially infected with *Tilletia foetens*. No variety was immune; the most resistant was line 58–56 of *Triticum vulgare* var. *hordeiforme* from the Tîrgu Frumos research station.

2506 Sandu-Ville, C., Lazăr, A. & Hatmanu, M.
Cîțiva factori ce determină intensitatea infecțiunii cu mălură la grîul de toamnă. (**Some factors which determine the intensity of infection by bunt of winter wheat**).
Lucrăr. ști. Inst. agron. Ion Ionescu de la Brad Iași 1958 : 207–23.
Comparative trials over 3–4 years of a series of Rumanian varieties artificially infected with bunt are reported. The degree of infection was markedly influenced by environmental conditions. The most resistant wheat was a selection of Odvoș 156 x Cluj 644.

2507 Urríes, M. J.
Razas fisiológicas de *Tilletia foetida* (Wallr.) Liro en España. [**Physiological races of *T. foetida* (Wallr.) Liro in Spain**].
An. Inst. bot. A. J. Cavanilles, Madrie 1958 : **16** : 339–46.
On the basis of their reactions on 10 differential wheat varieties, 15 samples of *T. foetida* collected from different localities in Spain fell into seven groups, of which two proved to be the previously known races L_3 and L_{10}. The remaining five are designated races A, B, C, D and E.

2508 Ambastha, H. N. S.
A comparative study of genes for resistance to bunt of wheat [*Tilletia caries* (D.C.) Tul. and *T. foetida* (Wallr.) Liro].
Proc. Bihar Acad. agric. Sci. 1955 : **4** : 41–58.
Pugsley reported that several selections involving Oro and Rapier in their parentage showed a differential response to races T–5, L–1, L–3 and L–14 [cf. XXI, 1776]. The present author has investigated the mode of inheritance of resistance to races T–1 and T–5 in three of these selections, viz. (1) 48–9 (Oro x

Rapier x Rapier), (2) 5719–3–1–1 (Oro x Rapier) and (3) 117–1–1 (Oro x Rapier), by means of an analysis of crosses of the three selections with Rapier and of (1) x (3). Evidence was obtained of three genes (*T*, *R* and *S*) for resistance, derived from Oro. *T* and *R* are major genes, possibly identical with the Turkey and Rio genes recognized in this variety by Briggs. *T* controls resistance to both T–1 and T–5, whereas *R* determines resistance to T–1 but not to T–5. It is suggested that *S*, a minor gene, confers resistance to T–1 and L–14 but has no influence on reaction to T–5 and L–3. The genotypes of (1), (2) and (3) are respectively postulated as *TTRRss*, *TTRRSS* and *ttrrSS*.

2509 Ambastha, H. N. S.
Environment and bunt infection.
Proc. Bihar Acad. agric. Sci. 1955 : **4** : 79–85.

Investigations were carried out on the reactions of the following wheats to race T–1 of *Tilletia caries* and race L–3 of *T. foetida* in sowings at different dates during 1951 and 1952 at the Waite Agricultural Research Institute, S. Australia: Dirk 51 (Orfed x Dirk^3), Hope, Hussar x family 115 and Renown, regarded as resistant to both races; Dirk 48, susceptible to both races; and selection 1403, resistant to T–1 but susceptible to L–3. The behaviour of Hope was difficult to interpret. In 1951, this variety remained practically resistant to both races, although it had respectively 14·4% and 10% infection by L–3 in the May and September sowings. In 1952, however, 37% of the plants were infected by L–3 and 41% by T–1 in the June sowing. It is therefore necessary to ascertain the genotype of Hope with respect to bunt resistance under optimum environmental conditions for infection, prior to analysing the interaction between this genotype and the environment. Other varieties in the first group maintained their resistance under different conditions of temperature and humidity. Sel. 1403 also remained resistant to race T–1. Variation in the amount of infection of Dirk 48 with both races and of Sel. 1403 with L–3 is ascribed to differences in the prevailing soil and air temperatures.

2510 Singh, H. G.
Breeding rust resistant *durum* x *vulgare* wheats for Uttar Pradesh.
Allahabad Fmr. 1958 : **32** : 198–201.

The characters required in new wheats for Uttar Pradesh are specified. A project of developing rust-resistant and otherwise improved varieties for the different agroclimatic zones of the state has been initiated. Promising crosses effected in 1957–58 are listed.

2511 Sikka, S. M. & Rao, M. V.
Inheritance studies in wheat. III. Inheritance of field reaction to black rust.
Indian J. Genet. 1958 : **18** : 34–40.

In the cross of *Triticum vulgare* 'NP790', a variety possessing field resistance to stem rust in India, with the susceptible variety NP718, resistance was dominant, a ratio of 3 resistant: 1 susceptible plants being obtained in the F_2 and F_3 [cf. XXVIII, 2773]. In crosses of NP790 with susceptible PbC281 and PbC591, trihybrid F_2 and F_3 ratios were obtained, with susceptibility dominant. It is suggested that PbC281 and PbC591 carried two dominant epistatic genes for susceptibility or two inhibitors.

2512 Watson, I. A. & Luig, N. H.
Somatic hybridization in *Puccinia graminis* var. *tritici*.
Aust. J. Sci. 1958 : **21** : p. 108. (Abst.).

Further investigations have been carried out on hybrids of *P. graminis* var. *tritici* resulting from a mixture of spores of two parental strains on wheat varieties. Nuclear fusion, followed by recombination and segregation to form dicaryons, is believed to be responsible for the diversity of strains obtained. Somatic hybridization was shown to be important in the field, since a prevalent strain was isolated from a mixture of spores from two other field strains. Sexual hybridization on barberry, mutation and somatic hybridization are now regarded as three important causes of variability in this pathogen.

2513 Tsai, H. *ET AL.*
(The breeding of several new rust-resistant wheat varieties suitable for northern Chinese regions: Nung-ta 36, Nung-ta 90, Nung-ta 183 and Nung-ta 498).
Pei-ching Nung-yeh Ta-hsueh Hsueh-pao/Sci. Rep. Peking agric. Univ. 1957 : **3** : 124–52. [Chinese].

The wheat breeding programme of Peking Agricultural University is described. A collection of over 4000 foreign varieties has been assembled and 200 crosses involving these and native varieties have been effected. Parental combinations between varieties coming from widely separated areas are preferred. Selection is performed in the F_2 onwards with special attention paid to resistance to yellow rust, cold and drought. Four yellow-rust resistant varieties, Nung-ta [Agricultural University] 36, 90,

183 and 498, are described. They were selected from the crosses Nung-ta 2 x Yen-ta 1817 [Peking University 1817] and Yen-ta 1817 x Kanred.

2514 Basile, R.
A new physiological race of *Puccinia graminis tritici* of low virulence on all the varieties of the differential series.
Robigo, Castelar 1958 : No. 6 : p. 3. (Also in Italian and Spanish).

A new race isolated from near Florence, Italy, was low in virulence on all 12 differential wheats, giving reaction types 0 to 2, but attacked Mentana severely, with reaction type 3. It is designated race 294.

2515 Santiago, J. C.
Geographical distribution and prevalence of the physiologic races of *Puccinia graminis tritici* determined in Portugal from 1951 to 1958.
Robigo, Castelar 1958 : No. 6 : 8–9. (Also in Portuguese and Spanish).

The most prevalent race is 21, followed by 186 and 17. All varieties grown are susceptible, but some escape attack through early development. Thatcher, Rescue, Yaktana, Baladi 116 [Local 116], Gabo 54 and Mayo 54 are used in breeding for resistance.

2516 Gokhale, V. P., Patil, B. P. & Desai, M. K.
Discovery of virulent isolates of race 42B of *Puccinia graminis tritici* in Bombay State.
Curr. Sci. 1959 : **28** : 81–82.

Seedling reactions of ten wheat varieties to race 42B and three new isolates are compared. Both isolate 42B–1 and 42B–2 are pathogenically different from and more virulent than race 42B and each may be regarded as a separate race, but isolate 42B–3 is a biotype of 42B.

2517 Mohamed, H. A. & ElSeify, M.
Wheat rusts situation in the Egyptian region of the United Arab Republic.
Robigo, Castelar 1958 : No. 6 : 9–10. (Also in Spanish).

The chief sources of resistance used in breeding at the Bahtim Experimental Station are *Triticum timopheevi*, for resistance to stem, leaf and yellow rusts, Kenya 338 AC and Lee, both resistant to leaf rust, and Newthatch. The cross Hindi 62 x Hindi 722 is resistant to all three rusts but is poor in quality.
Data on field reaction to stem and leaf rusts and greenhouse reaction to stem rust races 14, 17 and 21 are given for four commercial wheats and five new lines.

2518 Abdel-Hak, T.
Physiologic races of *Puccinia graminis tritici* in the United Arab Republic.
Robigo, Castelar 1958 : No. 6 : p. 12. (Also in Spanish).

The predominant races in Egypt are 17, 19, 21, 14 and 24.

2519 Johnston, C. O.
Physiologic races of *Puccinia recondita* (*P. rubigo-vera* f. sp. *tritici*) in the United States in 1957.
Plant Dis. Reptr. 1958 : **42** : 1244–45.

Collections of leaf rust on wheat were made at many places in the United States in 1957; 24 physiological races were isolated, the distribution and frequency of which are tabulated. Race 5 was the most abundant, comprising 35·8% of the total, followed by race 5 and 122 which were of importance in preceding years. The comparatively new races 130, 140 and 143 were isolated a few times each.

2520 Wilcoxson, R. D. & Paharia, K. D.
A study of the progeny from the self-fertilization of race 111 of *Puccinia graminis* var. *tritici*.
Phytopathology 1958 : **48** : 644–45.

At the University of Minnesota, race 111 of *P. graminis* var. *tritici* was selfed and 15 different races were identified among 23 isolates of the progeny; eight of the races appeared to be new. One race resembled the parent but was not the same. The wheat varieties Lee, Khapli and Vernal were resistant to all the isolates; the durum wheats were resistant to most of the races and Einkorn was resistant to 11 races.

2521 Rojas M., E.
Raza 29 de *Puccinia graminis tritici* Ericks y Henn (roya negra del trigo) en el Perú. [**Race 29 of *P. graminis tritici* Ericks. and Henn. (black rust of wheat) in Peru**].
Bol. trimestr. Exp. agropec. Progr. Coop. Exp. Agropec., Lima 1957 : **6** : No. 4 : 25–28.

Race 29 was found in Peru in 1956. Its pathogenicity on five wheat varieties differs slightly from that of strains occurring in the USA, Canada and Mexico. Twenty-one varieties showing various degrees of resistance in the greenhouse and in the field are listed.

2522 Watson, I. A. & Luig, N. H.
Wheat rust diseases in Australia.
Robigo, Castelar 1958 : No. 6 : 19–24. (Also in Spanish).

Sixteen leaf-rust strains occurring in Australia and their reactions on Thew, Gaza and Spica are listed. Mentana, Uruguay, Chinese White and Timvera are resistant as adult plants to all sixteen. Uruguay carries two independent dominant factors for resistance, one of which, conferring a physiological type of resistance, is also found in Norka and Malakoff; the other occurs also in Chinese White. Mentana has two linked factors controlling physiological resistance to the most prevalent strains. The physiological resistance of Uruguay has been combined with that of Mentana. Timvera derives its resistance from *Triticum timopheevi*. Resistance against all Australian strains, derived from *Aegilops umbellulata*, is being incorporated into commercial varieties.

Data on the prevalence of 11 stem-rust strains and a table showing their reactions on five differential varieties are given. Strains 21–Anz 1 and 21–Anz 2 are the most frequent. Sources of resistance used in breeding include: Webster, which shows morphological resistance; Eureka and other varieties carrying Sr_6 and its alleles; Gabo and Kenya 745C6042, carrying allelic or possibly identical genes; Kenya 744C6041, Kenya 117A and Egypt NA95, with Sr_9 or its alleles; W1656 (CI 12632) and Timvera, both with resistance derived from *T. timopheevi*; and Khapstein 1451, which has resistance against all strains, conferred by two factors cumulative in effect. Gabo derivatives carrying Sr_9 have been crossed with other Gabo derivatives carrying W1656 resistance. The Hope type of resistance is being combined with Sr_9 resistance. Among commercial varieties, Glenwari, Festival and Spica are resistant to all Australian stem-rust strains.

2523 Unrau, J., Kuspira, J. & Peterson, R. F.
Note on leaf rust reaction of Chinese spring (Thatcher) substitution lines.
Canad. J. Pl. Sci. 1958 : **38** : 268–69.

Chinese Spring wheat variety differs from Thatcher by genes on chromosomes IX, X, XII and XXI controlling leaf-rust reaction as determined by experiments with substitution lines in 1954–55 when the prevalent races of *Puccinia triticina* were 5a, 15a and 126a. A difference in time of outbreak of the epidemic in the two years gives an indication that genes on chromosomes IX and XXI are more effective than those on X and XII in bringing about mature-plant resistance.

2524 Campbell, A. B. & McGinnis, R. C.
A monosomic analysis of stem rust reaction and awn expression in Redman wheat.
Canad. J. Pl. Sci. 1958 : **38** : 184–87.

A monosomic series of Redman spring wheat was crossed with Prelude and genetic studies made of stem-rust reaction and awn expression. Monosomic F_1 plants deficient in chromosomes III, VIII and XIII of Redman were susceptible to *Puccinia graminis* "56", hence these chromosomes carry dominant factors complementary in action. Similar complementary dominant factors are located on chromosomes IX and XVII.

2525 Király, Z.
On the role of phenoloxidase activity in the hypersensitive reaction of wheat varieties infected with stem rust.
Phytopath. Z. 1959 : **35** : 23–26.

At the Research Institute for Plant Protection, Budapest, seedlings grown under greenhouse conditions were inoculated in the two-leaf stage with uredospores of race 21 of *Puccinia graminis* var. *tritici*. Enzyme activity was measured in both healthy and infected tissue, using the conventional Warburg technique. Phenoloxidase activity was not found in healthy leaves of the susceptible variety R23 but, using gallic acid as a substrate, considerable enzyme activity was detected in healthy leaves of resistant forms of *Triticum monococcum*, *T. dicoccum* and *T. timopheevi*. As a result of infection, enzyme activity appeared in the susceptible variety 14–16 days after the appearance of the first symptoms of the disease but the enzyme was not activated in the early stages of the disease. The infected leaves of the resistant varieties showed much higher polyphenoloxidase activity. It is concluded that the hypersensitive reaction of resistant wheats is connected with the activity of a polyphenol-phenoloxidase system.

2526 Garrett, W. N., Futrell, M. C. & Atkins, I. M.
Effects of stem rust of different infection intensities on yield and other factors in wheat.
Plant Dis. Reptr. 1958 : **42** : 1237–43.

Experiments with Bowie wheat in 1956–57, and with Bowie and Lee in 1957–58, were carried out to determine the effect of intensity

of infection by stem rust, *Puccinia graminis*, on yield, bushel weight and kernel weight. Bowie was inoculated with race 29 to which it is very susceptible, Lee with race 15B to which it is moderately susceptible. Losses were much greater for Bowie than for Lee.

2527 Sharp, E. L. & Emge, R. G.
A "tissue transplant" technique for obtaining abundant sporulation of races of *Puccinia graminis* var. *tritici* on resistant varieties.
Phytopathology 1958 : **48** : 696–97.
It is difficult to identify races of *P. graminis* var. *tritici* when they develop as a fleck on a resistant variety, no sporulation occurring. A procedure is described for transplanting such flecks into healthy susceptible leaves where sporulation occurs.

2528 Luginbill, P. (Jun.) & McNeal, F. H.
Influence of seeding density and row spacings on the resistance of spring wheats to the wheat stem sawfly.
J. econ. Ent. 1958 : **51** : 804–08.
In solid-stemmed Rescue and hollow-stemmed Thatcher, infestation and cutting by *Cephus cinctus* decreased as density of sowing increased and row spacing decreased. The decrease in cutting was due in part to a lower amount of infestation, which was in turn associated with decreases in moisture content at the peak of oviposition. An unexpected positive correlation between cutting percentage and stem solidity in Rescue was obtained. In view of the decrease in solidity at the higher rates of sowing, the low amount of cutting in this variety in such sowings was evidently due to other factors.

2529 Kasting, R., McGinnis, A. J. & Longair, E. L.
Moisture and nitrogen contents of stem tissues from solid- and hollow-stemmed varieties of spring wheat and their relation to sawfly resistance.
Canad. J. Pl. Sci. 1958 : **38** : 287–91.
An attempt to account for the resistance to sawfly of the solid-stemmed varieties of wheat, Rescue and Golden Ball, compared with the hollow-stemmed Thatcher on the basis of differences in moisture and nitrogen content of the pith has not shown any evidence suggesting that these factors are responsible for poor larval development in resistant varieties.

2530 Manoliu, M. & Raicu, P.
Cercetări privind influența regimului de lumină asupra creșterii și dezvoltării plantelor la soiurile de grîu de primăvară cultivate în țara noastră. (**Researches on the influence of light conditions on the growth and development of plants of spring-wheat varieties cultivated in our country**).
An. Lucrăr. ști. Inst. agron. N. Bălcescu București 1957 : 141–57.
The effects of various short-day treatments on the development of a series of Rumanian varieties were studied. The light stage of all the varieties was *ca.* 30 days except for Arnăut de Nemerci in which it was *ca.* 40 days.

2531 Ono, H. & Suemoto, H.
(Left and right handedness in *Triticum* seedlings).
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1957 : No. 8 : 60–66. [Japanese].
The accordance proportion is defined as the ratio, number of seedlings with phyllotaxis of the same sense (left or right handed) as the parental spikelet/total number of seedlings. This ratio was investigated in *T. monococcum*, *T. aegilopoides*, *T. durum*, *T. turgidum*, *T. timopheevi*, *T. vulgare* and *T. spelta*. It exceeded 50% in the 2*x* species *T. durum* and *T. turgidum* but not in *T. timopheevi* and 6*x* species when the first florets of the spikelets were studied. The ratio fell below 50% when seedlings from second florets were taken.
In crosses between *T. turgidum* and *T. timopheevi*, the accordance proportion showed maternal inheritance. The back crosses did not differ significantly from one another.

2532 Kihara, H.
Completion of genome-analysis of three 6*x* species of *Aegilops*.
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1957 : No. 8 : p. 3.
[Cf. XXVIII, 4116].

2533 Roy, R. P.
Genome analysis of *Aegilops sharonensis*.
Genetica 1959 : **29** : 331–57.
A cross was made between diploids of *Ae. longissima* and *Ae. sharonensis*. F_1 hybrids grew quite well and were vigorous; they were intermediate in many characters but shattering of the spikes, which is more marked in *Ae.*

sharonensis than in *Ae. longissima*, was dominant in the hybrid.

Chromosome pairing was quite regular in *Ae. sharonensis* and the chiasma frequency per cell was 13·53. *Ae. longissima* showed a few univalents; its chiasma frequency was 13·21 per cell. In the crosses the univalent frequency was 0·16 per cell when *Ae. longissima* was used as the female parent and 0·24 per cell in the reciprocal cross. Bivalent frequency was 6·92 per cell in *Ae. longissima* x *Ae. sharonensis* and 6·88 in the reciprocal; the frequency of ring bivalents was higher than the frequency of rod bivalents in both cases. There was a highly significant reduction in chiasma frequency per cell and per bivalent in the F_1 in comparison with the parent species. Male and female fertility was only about 50% in the hybrid; it is assumed that some genic differentiation in the genomes of *Ae. longissima* and *Ae. sharonensis* causes inviable combinations of genes to occur in the gametes of the F_1.

Crosses were made between the amphidiploids of *T. turgidum* x *Ae. sharonensis*, *Ae. longissima* x *T. dicoccum* and *T. dicoccoides* x *Ae. bicornis*. The double hybrids were also quite vigorous and showed intermediate characters.

Chromosome pairing in (*T. turgidum* x *Ae. sharonensis*) x (*Ae. longissima* x *T. dicoccum*) and the reciprocal cross showed a range of 18–12 bivalents per cell, i.e. the same range as that observed in the two parent amphidiploids; univalents and multivalents were rarely seen. The chiasma frequency in these amphidiploid hybrids showed a reduction in comparison with the parents, the difference being statistically significant. These hybrids were highly fertile.

The hybrid (*Ae. longissima* x *T. dicoccum*) x (*T. dicoccoides* x *Ae. bicornis*) and reciprocal had 15·96 and 16·24 univalents per cell and 12·86 and 11·72 bivalents per cell respectively; most of the bivalents were of the rod type and the chiasma frequency per cell was 16·70 and 16·12 respectively. In these hybrids, even the chromosomes of the *Triticum* genomes did not pair regularly. Similar chromosome behaviour was found in the amphidiploid hybrids (*T. turgidum* x *Ae. sharonensis*) x (*T. dicoccoides* x *Ae. bicornis*) and the reciprocal. These four amphidiploid hybrids were completely male and female sterile.

From these results it is concluded that *Ae. longissima* and *Ae. sharonensis* have homologous genomes, designated S^1; there is however some genic differentiation between the two species. The genome of *Ae. bicornis* is different from the S^1 genome.

2534 Hiratsuka, N.

Susceptibility of varieties of *Aegilops squarrosa* to black rust (*Puccinia graminis* f. sp. *tritici*) and brown rust (*P. triticina*).

Seiken Jiho/Rep. Kihara Inst. biol. Res. 1957 : No. 8 : 9–10.

Tests were carried out at the Laboratories of Phytopathology and Mycology, Tokyo University of Education, to determine the reactions of collections from the Karakoram and Hindu Kush regions.

All strains of vars. *anathera* and *typica* were susceptible to stem rust and races 1A and 21B of leaf rust as seedlings and mature plants. A collection of var. *meyeri* was resistant. In var. *meyeri* x var. *typica*, the resistance of the former was dominant, with apparently monofactorial segregation in the F_2. One strain of var. *strangulata* was susceptible to races 1A and 21B and moderately resistant or susceptible to stem rust, while another was resistant to leaf rust but susceptible to stem rust.

OATS

2535 Abrams, R. & Frey, K. J.

Effect of recurrent X-radiation on germination and seedling vigour in oats.

Proc. Ia. Acad. Sci. 1958 : **65** : 174–83.

In studies of oat plants of six varieties subjected to radiation in one, two or three successive generations, percentage germination was found to decrease with increasing number of irradiated generations. The vigour of the surviving seedlings was greater with increasing recurrent radiation at a high moisture content than at a low. These effects are thought to be due largely to chromosomal disturbance.

2536 Kent, N. L., Gill, W. D. & Holmes, J. C.

The yield and quality of oats in south-east Scotland trials, 1951-56.

Scot. Agric. 1958 : **38** : 126–32.

Information is given on the performance of 26 varieties studied in trials organized by the Edinburgh and East of Scotland College of Agriculture.

2537 Marjanen, H.

Kauralajikkeiden satoisuus paikalliskokeissa. **(Local experiments on the productivity of oat varieties).**

Koetoiminta ja Käytäntö 1957 : **14** : p. 35.

Varietal trials over the last thirty years are briefly reviewed; yield is compared with that of

Kultasade II [Golden Rain II] and data for performance in different localities and soil types are given for the more outstanding varieties. Sisu gives the highest average yield and is best for peat soils. The Swedish variety Nip and the Dutch Marne are also high yielding.

2538 Perttula, O.
Kauran lajikekokeet Lounais-Suomessa. (**Oat varieties of south-west Finland**).
Koetoiminta ja Käytäntö 1958 : **15** : p. 16.

A number of oat varieties are compared with Kultasade II [Golden Rain II] for grain yield, earliness and stalk length. The Swedish variety Blixt [Lightning] was highest yielding and six days earlier than the standard, and the stalk somewhat shorter. The shortest-stalked variety is Pendek, but this gave a comparatively poor yield.

2539 Waller, E.
Från Segerhavre till Solhavre II—några resultat från en femtioårig vithavreförädling. (**From the oat Seger to Sol II—some results of fifty years of breeding white oats**).
Sverig. Utsädesfören. Tidskr. 1958 : **68** : 296–305.

The history of the oat breeding work of the Swedish Seed Association since Seger [Victory] was first marketed in 1908 is surveyed, special reference being made to Seger, Guldregn I [Golden Rain I], Guldregn II, Örn [Eagle] and Sol II [Sun II] and their interrelationships.

2540 Haver, 1959. (**Oats, 1959**).
Landbouwvoorlichting 16 : Bijl. 37; Ber. Rassenkeuze 1959 : No. 254 : Pp. 6.

Tabulated data on the yields of 31 varieties tested on different soils in the Netherlands are given, together with notes on their agronomic characters.

2541 Morrison, J. W.
The inheritance of fluorescence in Clinton oats.
Canad. J. Pl. Sci. 1958 : **38** : 281–86.

Crosses were made between plants from seeds showing fluorescence under ultraviolet light obtained from a sample of nonfluorescent Clinton oats and the normal variety. Segregation occurred in a 3 : 1 ratio, the nonfluorescent character being inherited as a simple recessive. Variation in the intensity of fluorescence occurred, leading to the supposition that there is a factor tending to obscure fluorescence.

2542 Mitchell, W. G.
Speeding development of new oat varieties.
Sunshine St. agric. Res. Rep. 1958 : **3** : No. 1 : p. 8.

At the Florida Agricultural Experiment Station, use is being made of a growth chamber called the oatatron for raising neutron-treated material. Day length is controlled by means of both fluorescent and incandescent lighting and four generations may be produced in a single year.

2543 Murphy, C. F. & Patterson, F. L.
The effects of the chemical mutagen, diepoxybutane, on Clintland oats.
Proc. Ia. Acad. Sci. 1958 : **65** : 184–89.

When culms of Clintland were hypodermically injected with different concentrations of diepoxybutane, seedling growth of grain from tillers treated at an early stage of development was reduced and a number of compactoid and fatuoid mutants were obtained.

2544 **Varieties of oats.**
Fmrs'. Leafl. nat. Inst. agric. Bot. 1959 : No. 13 : unpaginated.

Information is given on varieties recommended as the result of trials carried out by the National Institute of Agricultural Botany, Cambridge, England.

2545 Valle, O.
Hollantilainen Pendek-kaura, uusi kurajaloste kauppaan. (**Pendek oats, a new commercial variety from Holland**).
Koetoiminta ja Käytäntö 1957 : **14** : p. 9.

Trials in 1955 and 1956 in different localities show that Pendek oats compares favourably with Kultasade II [Golden Rain II]. On rich soils and on peat it is particularly useful; it is shorter and stronger stalked and about 3 days earlier than Kultasade II, and is recommended in place of Eho for areas in southern Finland.

2546 Valle, O.
Pendek-kaura Suomen oloissa. (**Pendek oats under Finnish conditions**).
Maatalous ja Koetoiminta 1958 : **12** : 109–17.

Although lower yielding than Golden Rain II, Pendek has the advantage of short, strong straw and early ripening, and in some localities will give better returns than the former. It can be given heavy nitrogenous fertilizing.

2547 **Coker releases new oat for south.**
Seed & Gdn. Merch. 1958 : **21** : No. 8 : p. 21.

Developed by Coker's Pedigreed Seed Company, Hartsville, SC, the dual-purpose winter oat Moregrain combines resistance to Victoria blight, all known races of crown rust, two of the three races of smut occurring in the southern USA, mildew, soil-borne mosaic and yellow leaf. It has surpassed Arlington and Victorgrain in grain and forage production.

2548 Wiggans, S. C.
The relationship of total nitrogen percentage to yield, test weight and groat percentage of oats grown at different locations.
Proc. Ia. Acad. Sci. 1958 : **65** : 197–200.

Studies of 12 oat selections grown in 11 different states in 1957 revealed highly significant differences in total nitrogen content of the grain both among strains and among localities. None of the correlations between total nitrogen percentage and yield, test weight and groat percentage was significant.

2549 Norden, A. J.
Factors associated with lodging resistance in oats.
Diss. Abstr. 1958 : **19** : LC Card Mic 58–2195 : 13–14. (Abst.).

Seven varieties and three crosses were studied at the Iowa State College with respect to the relationships of lodging resistance, as measured by the cL_r method [cf. XXVIII, 1331], with (1) culm diameter, (2) thickness of the culm wall, (3) area of culm tissue in cross section, (4) culm height and (5) grain yield per panicle. Of the first three measurements, high values for (1) and (3) were the most closely associated with high cL_r values, F_3 genotypic correlations between lodging resistance and these two characters being fairly high. A significant negative association was found between (4) and lodging resistance. It is stressed that lodging resistance is a complex property which cannot be entirely explained on the basis of culm measurements and that varietal differences do not necessarily conform to established associations. The most consistent correlations between cL_r readings and culm measurements were obtained when the latter were taken half an inch above ground level. Preservation of culms in alcohol gave somewhat more consistent results than freezing; drying was completely unsatisfactory. The correlation between lodging resistance and (5) was so low as to be of little importance in breeding. Data on changes in cL_r values from anthesis to maturity in four varieties indicated that lodging resistance may be compared at any time during this period provided that the plant types and stages of development are similar. Standard unit heritability percentages for lodging resistance ranged from 9 to 22, showing that this character was strongly influenced by environmental variations. Selection of segregates with greater resistance than the parents should however be possible, since in all three crosses transgressive segregation occurred. In addition to the possibility of improving resistance by crossing the most resistant varieties and selecting for strains transgressing the parents in a positive direction, it may be possible by induced mutation to decrease the height of a tall strong variety while maintaining culm diameter.

2550 Endo, R. M. & Boewe, G. H.
Losses caused by crown rust of oats in 1956 and 1957.
Plant Dis. Reptr. 1958 : **42** : 1126–28.

An investigation of losses due to crown rust of oats, *Puccinia coronata*, in Illinois in 1957, shows the outstanding resistance of the variety Clintland in contrast to the highly susceptible Clinton. The predominant races of rust were 202, 203, 213 and 216. Clintland is however as susceptible as Clinton to races 276 and 290 which appeared late in the season and did little damage. Newton and Nemaha, although possessing some rust tolerance, suffered considerable yield losses under epidemic conditions.

2551 Gustavsson, A.
New races of oat stem rust and crown rust in Sweden.
Robigo, Castelar 1958 : No. 6 : p. 15. (Also in Spanish).

Three stem rusts similar to races 3, 4 and 6 but attacking Rodney were found in 1956 and 1957 and are called 3A, 4A and 6A. A new crown-rust race from Central Sweden, designated 297, attacks Victoria and Ukraine but gives a highly resistant reaction on the other differentials.

2552 Wahl, I.
Studies on crown rust and stem rust on oats in Israel.
Bull. Res. Counc. Israel : Sect. D : 1958 : **6D** : 145–66.

In tests carried out on the reactions of a large number of varieties to crown rust (*Puccinia coronata* var. *avenae*) and stem rust (*P. graminis* var. *avenae*) over a six-year period in Israel, the Brazilian variety Saia and Minnesota selections Minn. II–47–12 and Minn. II–47–17 have been highly resistant to both rusts. The

resistance of the local selection Rehovot to crown rust has been outstandingly high. The "Canadian" factors for resistance to *P. graminis* var. *avenae* have afforded protection against this pathogen. In the case of crown rust, races 264, 270 and 276 prevailed. Attention is drawn to the similarity of crown-rust races predominant in Israel with those reported as occurring in Argentina. The extremely virulent stem-rust race 6 comprised about 97% of the isolates. It is postulated that the prevalence of highly virulent races of both rusts in Israel reflects an advanced stage in the mutual evolution of host and pathogen. It is further suggested that testing of crops in the centres of their origin, where highly virulent races of pathogens are likely to occur, is likely to provide the breeder with valuable information on the potentialities of genes for resistance.

2553 Green, G. J.
Physiologic specialization in oat stem rust in Canada.
Robigo, Castelar 1958 : No. 6 : 29–30. (Also in Spanish).

Biotypes 7A, 8A and 13A, all attacking Rodney, and the last two also attacking Garry have been identified in recent years. Race 13A is regarded as particularly dangerous since it is virulent on varieties carrying the *A*, *B*, *C* and *D* genes for resistance and moderately virulent on those with the *E* gene. Hajira (*A* gene), Rodney (*BC*) and Garry (*ABC*) are used in breeding, together with a new source of resistance to 8A and 13A.

2554 Green, G. J.
Pathogenicity of two new races of oat stem rust.
Plant Dis. Reptr. 1958 : **42** : 1080–83.

Two new races of stem rust of oats, *Puccinia graminis*, are described. These are termed 8A and 13A and attack oat varieties Rodney and Garry, both of which are resistant to races 8 and 13. Seedling reactions of a selected group of varieties to these races and also to races 7, 7A, 8 and 13 are given. Those with rust resistance from variety White Russian were moderately resistant to race 8A; those with resistance from variety Jostrain are mesothetic in reaction to race 13A. *Avena strigosa* and some of its hybrids showed maximum seedling resistance to all races tested.

2555 Simons, M. D. & Michel, L. J.
Physiologic races of crown rust of oats identified in 1957.
Plant Dis. Reptr. 1958 : **42** : 1246–49.

Four new races of *Puccinia coronata* are described on the basis of their effects on 10 standard crown-rust differential varieties. Races 294 and 295, very closely related to 290 and 293, are distinguished from each other only by the reaction induced in Anthony, which is susceptible to 295. Victoria, Trispernia and Bondvic are resistant to this group of races, but not Landhafer or Santa Fe which are being widely used as sources of resistance to crown rust.

The distribution and frequency of 26 races in North America in the very severe season of 1957 are tabulated. These show a striking prevalance of races attacking Victoria and Landhafer.

2556 Luke, H. H., Chapman, W. H., Wallace, A. T. & Pfahler, P. L.
Oat selections resistant to certain Landhafer-attacking races of crown rust.
Plant Dis. Reptr. 1958 : **42** : 1250–53.

The occurrence and distribution of races of *Puccinia coronata* attacking Landhafer is reviewed. Work on the selection of lines resistant to race 264 is described. Two groups show promise. Selections of irradiated Floriland have shown high resistance under diverse nursery conditions in two seasons. They should be used in combination with Trispernia or Bondvic which possess resistance to race 290. The line CI7172, introduced from Argentina in 1951, was found to be resistant to race 264. Selections of the F_5 generation of CI7172 x (0–200–10 x Southland) have been tested in three localities. Results show varying degrees of resistance, with an indication that this breaks down to some extent in hot weather. In Florida, however, all lines were resistant and on other grounds also these lines are considered the most promising available to oat breeders in the southern USA.

2557 Chapman, W. H., Luke, H. H., Wallace, A. T. & Lunden, A. O.
Multiple variation including crown rust resistance in irradiated Floriland oats.
Agron. J. 1959 : **51** : 163–65.

Family 7 derived from seed of Floriland (Florida 167 x Landhafer) which had been exposed to thermal neutrons for 5 hr. showed extreme variation in morphological characters in the N_3 and N_4. Floriland is highly resistant to all races of *Puccinia coronata* var. *avenae* prevalent in the USA, with the exception of the so-called Landhafer races. Under greenhouse conditions, some lines derived from family 7 showed a type of reaction to Landhafer race 264 indicative of

mature-plant resistance, while other lines exhibited a markedly mesothetic reaction to this race. Some selections were highly resistant to another Landhafer race, race 290, although no single selection proved to be highly resistant to both races. Field resistance to race 264 under widely different conditions was also found in some selections from this family. Chromosome bridges, micronuclei and a high degree of sterility were found among the lines. The chromosome aberrations and successive outcrossing may have been jointly responsible for the multiple reactions to crown rust and for the morphological variation. Additional research in progress may elucidate the origin of both types of variation, although the resistance to races 264 and 290 is at present considered to be the result of induced genetic variation.

2558 Romanko, R. R.
A physiological basis for resistance of oats to Victoria blight.
Phytopathology 1959 : **49** : 32–36.
[Cf. 1443].

2559 Dieter, A.
Beobachtungen über *Heterodera major* O. Schm. an Hafer. 1. Mitteilung. (**Observations on *H. major* O. Schm. on oats. I**).
NachrBl. dtsch. PflSchDienst., Berl. 1958 : **12** : 155–58.
Seventeen varieties were investigated in central Germany; the winter varieties appeared to be resistant to *H. major*.

RYE

2560 Wallin, J.
Syysrukiin lajikekokeet Kasvinviljelylaitoksella. (**Winter rye varieties at the Department of Plant Husbandry**).
Maatalous ja Koetoiminta 1958 : **12** : 132–39.
A number of winter rye varieties are compared with Toivo [Hope] as standard for grain yield, winter hardiness and length and strength of straw over the years 1927–53. It is concluded that no new varieties have been produced which are superior to Toivo, but the short-strawed variety Pekka is recommended where extreme winter hardiness is not required and combine harvesting can be carried out.

2561 Forsøg med rugsorter 1954–1957. (**Trials of rye varieties, 1954-1957**).
Tidsskr. Planteavl 1958 : **62** : 735–38.
Data on the performance of eight varieties and élites tested at 10 localities on different soil types in Denmark are presented.

2562 Stutz, H. C.
A new macromutation in rye.
Proc. Utah Acad. Sci. 1957 : **34** : 59–60.
A rye mutant was found with a character typical of *Hordeum*, viz. three spikelets at each node. Some of the mutant segregates in subsequent generations had variable numbers of spikelets per node. Since this feature is common in *Elymus*, the mutant was termed *elymoides*. In a cross with a normal plant from the same population in which the mutant was discovered, the mutant behaved as a simple recessive. A similar mode of inheritance was shown by the cross of *elymoides* with a Turkish rye strain. The mutant F_2 segregates showed, however, considerable variation in the expression of the *elymoides* character, the number of spikelets per node ranging from two to six within the same ear. The penetrance of the gene appeared, however, to be complete at least in some part of each culm of a plant. In an F_2 population derived from a cross with the rye Merced, incomplete penetrance was common within culms. Some of the mutant segregates were detected by variation at a single node within the entire plant. In F_2 *elymoides* x *Secale montanum*, the mutation behaved as a dominant. Many of the mutant segregates showed incomplete penetrance from culm to culm and only slight expression of the *elymoides* condition within ears. It appeared that the *S. montanum* genotype affected the dominance relationship by influencing the penetrance. The behaviour of the mutation when introduced into a dwarf strain of Merced suggested that its penetrance and therefore its dominance were affected by the growth rate. Full penetrance was attained in dwarf plants. It may therefore be inferred that the mutant phenotype is suppressed in a rapidly growing heterozygote and is fully penetrant in a slowly growing heterozygote, so that the mutation behaves as a recessive in the former and as a dominant in the latter.

2563 Dimenštejn, F. I.
(**Biochemical composition of the grain of rye occurring in the fields of other crops**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 5 : 65–67. [Russian].
Analyses carried out at the Institute of Plant Industry showed that ryes from Afghanistan, Central Asia and North Caucasus possess breeding value since they have larger grain and a

higher protein content than such cultivars as Vjatka. Most F_1 and F_2 hybrids between the forms rich in protein, acting as mother plants, and cultivars, acting as pollen parents, equalled or even exceeded the ♀ parent in protein content and were intermediate between or superior to both parents in productivity. The 1000-grain weight in the F_1 was 23–40·4 g. and in the F_2 28–39·9 g. Differences in the kinds of proteins present in the hybrids and the initial forms are referred to briefly.

2564 L'VOVA, I. N.
(A description of the germination of rye pollen in an artificial medium).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.): Otdel biol. (Biol. Ser.) 1958 : **63** : No. 4 : 87–91. [Russian].

The optimum conditions for pollen germination and the growth of pollen tubes of the varieties Vjatka and Onohotskaja were obtained by increasing moisture and reducing aeration in a 1% agar-sucrose substrate. The sucrose concentration giving the best results with Vjatka was 20–35% and that with Onohotskaja 25–40%.

2565 LISTOWSKI, A.
Über den Einfluss der Jarowisation und des Kurztages auf die Entwicklung des Roggens. **(The influence of vernalization and short photoperiod on the development of rye).**
Züchter 1958 : **28** : 314–20.

The studies described were conducted in Puławy, Poland, with vernalized and nonvernalized plants of Petkus and Vjatka, a variety from north Russia. In all cases, short-day treatment slowed down the development of the ears; this effect was independent of whether the treatment was applied at the beginning or end of the growing period but depended on the duration of the treatment. Biotypes with different vernalization requirements were found in each variety.

MAIZE

2566 MÁNDY, GY.
Ökológiai vizsgálatok kukoricafajtákkal. **(Ecological investigations on maize varieties).**
Kukoricatermesz. Kísérl., 1953–1957 (1958) : 91–103. [from: Hungar. agric. Rev. 1958 : **7** : No. 4 : 3–4].

In tests of 11 maize varieties, conducted at seven localities in Hungary, marked differences in height were observed according to locality, the early dent variety Bánkút showing the greatest variation in height and "F" the least. Variation was generally greater in varieties of tall habit than in smaller varieties. Hungarian maizes proved less exacting in ecological requirements than the introduced varieties. On the basis of growth rate, the varieties fell into the following groups, in order of increasing susceptibility to changes in ecological conditions: the hybrids Mv5 and Ól; Aranyözön [Golden Flood], Martonvásár yellow smooth "FB", Szeged yellow dent and Mindszentpuszta yellow dent; Mezőhegyes "F" and the early yellow dent "F"; and Mindszentpuszta white smooth, Székács sweet corn and Bánkút early dent.

2567 ALIHANOV, G. A.
(Let us improve maize seed production!)
Kukuruza (Maize) 1958 : No. 5 : 22–24. [Russian].

This article, dealing with maize seed production in Georgia, mentions the local standard varieties Adžametskaja Belaja [White Adžametskaja] and Abašskaja Želtaja [Yellow Abašskaja]; they are said to outyield all new Georgian hybrids and introduced varieties and hybrids and are unsurpassed in flour quality. It is intended to cross both the above varieties and also Abašskaja Poluzubovidnaja Mestnaja Belaja [Abašskaja Semident Local White] and Gegutskaja Želtaja with inbred lines now being developed from local material in Georgia.

2568 CĂRĂUȘU, D., OPRIȘOR, N., DUMITRESCU, O., LAZĂR, M. & BOLDEA, E.
Rezultatele culturilor comparative cu soiuri, hibrizi și populații de porumb, efectuate la Ezăreni-Iași în anii 1954–1957. **(The results of comparative trials with varieties, hybrids and populations of maize carried out at Ezăreni-Iași in the years 1954-7).**
Lucrăr. ști. Inst. agron. Ion Ionescu de la Brad Iași 1958 : 191–205.

Data are provided on yield and the percentage of protein, fat, starch and ash in the dry matter. The highest yield was obtained from the hybrid Portocaliu de Ezăreni [Ezăreni Orange] x Brown County; protein content was highest (13·67% of the dry matter) in the variety Portocaliu de Tîrgu Frumos [Tîrgu Frumos Orange].

2569 GARZA M., A. & OSLER, R. D.
Maíces mejorados en el Bajío en 1957. **(Improved maizes in the Bajío in 1957).**
Agric. téc. Méx. 1958 : No. 6 : 5, 48.

Tables are presented showing the yields of the

hybrids H–353, H–352 and H–309, the synthetic VS–5 and the variety Argentina under irrigated conditions in the Bajío; the first two give very good yields. For sowing in the rainy season H–309, H–230 and H–220 are recommended.

2570 Bunting, E. S. & Willey, L. A.
Problems involved in the cultivation of maize for fodder and ensilage. I. The choice of variety.
J. agric. Sci. 1959 : **52** : 95–105.

A report is given of the results of an evaluation of hybrids and open-pollinated varieties in southern England during the period 1951–56 with respect to: earliness as indicated by days from sowing to anthesis and percentage contribution of the ear to the total dry matter produced at harvest; plant height; yield of green matter; dry-matter content at harvest; yield of dry matter per acre; relative contribution of the ear to the total dry weight of the shoot; chemical composition of the dry matter; and yields of crude protein, crude fibre and N-free extractives per acre. It is concluded that, in general, hybrids with a range in earliness represented by the early hybrid Wisconsin 275A and medium late Wisconsin 341A are likely to be the best suited for fodder production and ensilage. The slightly greater production of dry matter by a very late variety such as White Horsetooth is offset by lower yields of nutrients and by extra difficulties imposed in harvesting and conservation. On the other hand, the evidence suggests that very early varieties such as Jaune Gros du Domaine are too unproductive of dry matter to compete with later varieties. European hybrids similar in maturity to Jaune Gros du Domaine but with considerably greater productivity may however shortly be available. In the meantime, use of a medium-early hybrid such as Wisconsin 416 in southern England may be expected to result in an average gross yield of 18–22 tons per acre with a dry-matter yield of about 4 tons.

2571 Obolensky, G.
Utilization of heterosis in corn breeding and the production of hybrid seed.
Qual. Plant. Mater. veg. 1958 : **5** : 95–107.

A general survey of the above topic is provided; explanations of hybrid vigour and methods of producing hybrid seed are outlined. Also the development of special types of maize for particular purposes, new techniques for creating uniform strains without prolonged inbreeding and the utilization of male sterility for simplifying crossing procedure are mentioned.

2572 **Report of the Tenth FAO Hybrid Maize Meeting held at Madrid, Spain, from 22 to 27 September 1958.**
FAO UN, Rome : Agric. Div. : 1958 : FAO/58/10/8210 : Pp. 29. (Mimeographed).

The report includes a summary of the discussions, the following being among the topics considered.

The results from the first cycle of an experiment on recurrent selection at Wageningen, Netherlands, were given. A procedure of unilateral recurrent selection involving an open-pollinated local variety and well-established single cross has the possibility of improving the combining ability of the variety. The progress achieved in one cycle (4–5 years) may be so considerable that the first-cycle synthetic, when crossed with the single-cross tester, provides a hybrid acceptable for temporary commercial use. Other applications of recurrent selection were indicated.

Progress in the use of cytoplasmic male sterility in the production of hybrid seed was examined. About half of the hybrid seed produced during 1958 in the USA was obtained by this method, mixing the sterile and fertile components of the final double crosses being the usual procedure. Single-cross ♂ parents with fertility-restoring genes became available in 1958 for commercial planting. Procedures for transferring cytoplasmic ♂ sterility and fertility-restoring genes were discussed and available sources of restoring genes reviewed. Sources of restoring genes have been identified within European flint varieties. The discovery of such genes avoids the necessity of transferring them from dents, and thus the danger of reducing the genetic divergence between the two types.

In the USA increasing interest has been shown in so-called commercial single crosses which are in fact produced in the same general manner as double crosses, from single crosses each derived from two closely related strains. Crosses of this kind may perform well under the conditions to which they are specially adapted, although their performance usually varies more according to season and locality than that of a well-adapted double hybrid. Seed costs range from 25% greater to double the price of double-cross seed. In outlining the work of the Rockefeller Foundation and US National Research Council in collecting, maintaining and classifying indigenous strains in Central and South America, U. J. Grant drew attention to the possibility that some types may have characteristics useful in improving maize in Europe. One such

characteristic is the ability shown by some races from higher altitudes in S. America to grow at low temperatures.
Problems of breeding for resistance to the European corn borer in Mediterranean countries were considered.
In the discussion of breeding hybrids particularly suitable for human consumption, it was emphasized that the variation in the requirements of the consumers in the different countries is so wide that determination of general criteria of selection is not possible.
Studies on cold tolerance in northern Europe have been concerned with elucidating the effects of soil and air temperatures on growth as it is considered that such effects must be known before breeding for tolerance can be undertaken.
Work on national collection of local varieties continued in most countries.
The organization and problems of maize breeding in India are surveyed. The projects at the main and subsidiary stations are directed towards the production of flint-dent crosses and synthetics, utilizing high-yielding dent inbreds from the USA and flint types from India and South and Central America. Judging from top-cross material under trial, the first Indian hybrid is expected to be released in 1959 or 1960.
In view of the inability of FAO to continue to finance the hybrid maize project, a provisional agreement was made between FAO and the European Association for Research on Plant Breeding (EUCARPIA) concerning the organization of a maize section within EUCARPIA for the continuation of the project.

2573 Virion, J.
Hodowla wsobna kukurydzy w Czechosłowacji. (**Maize inbreeding in Czechoslovakia**).
Postępy Nauk Roln. 1957 : **4** : No. 3 : 127–35.

F_1 double-cross hybrid seed is being produced by state agricultural stations. Inbreeding is being effected in all Czech varieties and some introduced material, the S_7 generation having been reached in some of the former.

2574 Fenaroli, L., Mancini, E. & Brandolini, A.
Nuovi ibridi di mais per l'agricoltura centro-meridionale. (**New maize hybrids for agriculture in the central and southern areas**).
Maydica, Bergamo 1959 : **4** : 4–12.

In addition to testing American hybrids, maize breeders in Italy have also been producing hybrids based on lines selected from local varieties. Some of these have excelled the American hybrids and two new hybrids are announced for 1959.
IAB300 is a semiflint maize produced by the University of Bologna from pollination of the single cross Wisconsin 270 (W79A x W75) by a single cross from two inbred lines, 3L and 1A, from the Italian flint variety Nostrale Marchigiano. The hybrid has long ears with 16–18 rows of grains, has a maturity rating of 122 days, and is more resistant than Wis.270 to corn borer and smut, though somewhat less resistant to lodging; it is adapted to a wide range of localities in central and southern Italy, where its yields have surpassed those of Wis.270 by up to 34%.
Insubria 295 was produced at the Maize Research Station at Bergamo by pollinating the dent single cross Wisconsin 79A x Wisconsin 75 with a single cross from two Italian flint lines, Lo11 from Nostrano dell'Isola and Lo33 from Isola Basso. The hybrid is early and resistant to spring frosts and summer drought; in tests in various parts of southern and central Italy it has exceeded the local varieties in grain yield by 6–1300% and Wis.270 by up to 45%.

2575 Brandolini, A.
I mais ibridi in Italia. (**Hybrid maize in Italy**).
Sci. e Lav. 1956 : No. 10 : 1–16; and Pubbl. Staz. sper. Maiscolt., Bergamo 1957 : No. 89.

After a brief explanation of the principles of producing hybrid maize, figures are quoted showing the rise in the amount grown in different parts of Italy in the period 1948–55. In Lombardy it rose from 2·5% to 73·9% of the area under spring-sown maize, whereas in areas without irrigation hybrids of the American dent type were less successful; nor have they been successful in areas subject to root and stalk rots, corn borer or low temperatures during germination and grain maturation. A successful flint hybrid, Insubria 2201, has been produced from Italian lines and has given good results in northern Italy where low temperatures are a limiting factor and other flint hybrids now being tested show promise of equalling the dent hybrids in productivity. Insubria 521, obtained by pollinating a dent hybrid by a flint, has given the highest yields of any under conditions of low temperature and high moisture and exceeded 100 c. per ha. of grain in 1956. Other hybrids of the same type have also exceeded the dents under these conditions,

while others again have exceeded them in the dry zones of central Italy, or in late sowings of maize after wheat.

2756 GASANOV, R. R.
(Let us increase maize production).
Kukuruza (Maize) 1958 : No. 5 : 7–8. [Russian].

Mention is made of breeding work with maize which began in Azerbaijan in 1955 with the foundation of a collection of local varieties and material from the Institute of Plant Industry. The aim is high-yielding varieties and hybrids adapted to the varied local climatic and soil conditions. The double cross Krasnodar 5 proved productive of grain and forage in the 1956 trials under irrigation and under rainfed conditions.

2577 EMIL'JANOV, I. E.
(A conference on hybrid maize in Bucureşti).
Kukuruza (Maize) 1958 : No. 5 : 62–63. [Russian].

This account of a conference, held by the Council of Mutual Economic Aid in 1958, mentions exchange of information on hybrid-maize breeding and of seed material between the member countries, Albania, Bulgaria, Czechoslovakia, the German Democratic Republic, Hungary, Poland, Rumania and the Soviet Union.

2578 NAKAMURA, N. & TATE, S.
(On first generation hybrid seed production in maize using advanced generations. II. The effects of selection in both parental single-cross populations).
Hyogo Noka Daigaku Kenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. 1955 : **2** : 15–21. [Japanese].

A comparison was made of the performance of double-cross hybrids of the type $F_1 \times F_1$ and of combinations involving selected advanced generations of the types $F_1 \times F_2$, $F_2 \times F_2$, $F_2 \times BC_1$, $F_2 \times BC_2$, $BC_1 \times BC_1$ and $BC_2 \times BC_2$. While significant differences in the performance of some of these types of combinations were noted—in particular $BC_2 \times BC_2$ was superior to $F_2 \times F_2$—it is concluded that selection in advanced generations of the original single crosses is not generally warranted.

2579 VAN SCHAIK, T.
Hybrid maize very profitable in Transvaal region.
Fmg. in S. Afr. 1959 : **34** : No. 11 : p. 49.

Information is given on the performance of South African double hybrids and top crosses in the Transvaal. In trials during the past three seasons, hybrids have outyielded ordinary varieties by about 25% on the average. Further improvements in maize for this region, expected from hybrid breeding in progress in South Africa and other countries, are briefly indicated.

2580 EVERETT, H. L.
Report of the Thirteenth Northeastern Corn Improvement Conference, New York City, February 28 and March 1, 1958. Pp. 14. (Mimeographed).

In the initial session, the main discussion centred on the problems of stalk breakage. C. W. Boothroyd suggested that a cooperative Northeastern regional project of research on the hereditary and environmental factors involved might be established. J. G. Buchert reported that all of the factors apparently contributing to stalk-rot resistance or standability may reflect an auxin basis. If the organisms responsible for stalk rot were inhibited by auxins, testing of inbreds for these substances would offer a means of selecting for resistance. This speaker also noted that an experiment in cooperation with D. L. Matthews is in progress to test inbreds for reactions to 2,4-D; such reactions appear to be similar to those to auxins. The second session included a contribution on dwarf hybrids by D. L. Matthews. Dwarf hybrids had performed as well as normal ones in many variable environmental situations. Their standability was very good, although in yield they were not so consistently promising. Topics dealt with in the third session included the following. J. G. Buchert presented data on the genic restoration of the S type of cytoplasmic sterility by the Ky21 source. Evidence has been obtained of ♂ gamete selection in the maintenance of selfs from A158S4 (A158 x Ky21) and other material. A consistent segregation of 6 fertile : 5 sterile had been observed in the test cross of heterozygous restored T steriles to completely T sterile stocks. L. L. Huber and other speakers referred to various problems and their future implications; the importance of developing extra early hybrids for the peripheral areas of the northern maize-growing region was stressed. As in previous meetings, the problem of the preservation of open-pollinated varieties was considered. H. T. Stinson pointed out that it may be desirable in the future to retain valuable cytoplasms as well as genomes. Collections should therefore be used as ♀ parents in crosses with the more common maize stocks.

2581 Genter, C. F. & Shulkcum, E.
Performance records of corn hybrids tested in Virginia, 1951-1956.
Res. Rep. Va. agric. Exp. Sta. 1957 : No. 13 : Pp. 13. (Mimeographed).
The results of trials of the performance of maize hybrids in several localities in Virginia during 1951–56 are summarized.

2582 Crowley, A. J. & Jones, E. L.
Measured crop performance. Corn 1958.
Res. Rep. NC agric. Exp. Sta. 1958 : No. 12 : Pp. 19.
The results of tests of maize hybrids on private farms and branch experiment stations in North Carolina during 1958 are reported.

2583 **1956 corn hybrids and varieties.**
Circ. Miss agric. Exp. Sta. 1957 : No. 207 : Pp. 8.
Information is given on the performance of commercial and experimental maize hybrids at 11 centres in Mississippi with respect to yield, root and stalk lodging, injury due to ear worm and rice weevil, shelling percentage and other characters. The problem of rice weevil becomes increasingly important the further south the crop is grown. Several experimental hybrids and the commercial hybrids Dixie 18, Funk G740, McCurdy, Coker 811 and La. 521 showed good resistance to the pest.

2584 Hutchcroft, C. D. & Robinson, J. L.
The 1958 Iowa corn yield test.
Bull. Ia. agric. Exp. Sta. 1959 : No. P–126 : Pp. 20.
A report is given of the performance of maize hybrids with open and closed pedigrees in tests carried out during 1958 throughout Iowa.

2585 Shank, B. & Kratochvil, D. E.
S.D. 210. A new corn hybrid for northern South Dakota.
S. Dak. Fm. Home Res. 1958 : **10** : No. 1 : 6–7.
Adapted to the northern part of South Dakota, the yellow hybrid SD210 [(SD5R x B8) x (SD26 x A509)] is earlier in maturity than SD220 and SD250 and has usually outyielded these hybrids. SD210 has an ear height adequate for mechanical harvesting and has suffered from only a negligible amount of lodging.

2586 Loeffel, F. A. & Shane, J. F.
Results of the Kentucky hybrid corn performance test—1958.
Progr. Rep. Univ. Ky. agric. Exp. Sta. 1959 : No. 74 : Pp. 23.
The results of the relative performance of 49 yellow and white maize hybrids tested at 6 different sites in Kentucky are reported. Data are provided on yield, ear moisture at maturity, percentage of erect plants and ear height.

2587 Caputa, J.
Maïs hybrides en Suisse romande. Résultats d'essais 1948–1955. (**Hybrid maize in French-speaking Switzerland. Results of trials, 1948-1955**).
Landw. Jb. Schweiz. 1958 : **72** : 425–44; also Publ. Sta. féd. essais agric. Lausanne 1958 : No. 561.
Trials conducted at many places in French-speaking Switzerland have shown that certain foreign hybrids are superior to open-pollinated varieties both for grain and silage production. The Swiss hybrid Orla 266 has given better results than the foreign hybrids.

2588 Gilmore, E. C. (Jun.) & Rogers, J. S.
Evaluating corn inbreds and hybrids by means of planting dates.
Agron. J. 1959 : **51** : 139–43.
The results indicated that the problems entailed in testing under a sufficient range of environmental conditions may be partly overcome in the southern USA, where the growing season may be as long as 250 days, by using different dates of planting in one year, this method being particularly useful in the evaluation of characters such as resistance to frost, drought and lodging.

2589 Brandolini, A.
L'utilizzazione della sterilità ereditaria del polline nella produzione commerciale delle sementi ibride di mais. I e II. (**The use of hereditary pollen sterility in the commercial production of hybrid maize seed. I and II**).
Maydica, Bergamo 1958 : **3** : 99–118; 1959 : **4** : 13–23.
A detailed historical review is presented of work in the USA on the use of cytoplasmic male sterility and restorer genes.
Lines possessing restoring genes have been selected from a number of Italian maize varieties and have been tested in various combinations with male-sterile American lines. They proved more effective in restoring fertility in line $WF9^{s}$ than in $WF9^{T}$ or $WR3^{T}$. Those capable of restoring fertility to $WF9^{T}$ did so also to combinations with cytoplasm T/genome WR3 but to a lesser extent, showing that lines WR3 and WF9 must differ genotypically. Restorer genes seem to be particularly frequent in the Scagliolo-Rostrato group of varieties, though even here they are not as frequent as in the maize varieties of Central and South America,

from which the Italian maize is thought to have derived.

2590 Gonzales, T. T., Gianzon, E. & Cruz, O. J.
The breeding for cytoplasmic male sterility and male fertility restorers.
Pl. Industr. Dig., Manila 1958 : **21** : Nos. 9–10; 9–15.

A general outline is given of the use of cytoplasmic male-sterile inbreds and pollen-restoring inbreds in the production of hybrid maize and of the work being carried out in the Philippines to develop such inbreds by Eckhardt's procedure of simultaneously producing the two types of lines in one breeding programme [cf. XXIV, 159].

2591 Maroso, G.
Mais ibridi precoci a granella vitrea rossa costituiti dall'Istituto di Genetica di Lonigo. (**Early maize hybrids with red flint grain produced by the Institute of Genetics, Lonigo**).
Agricoltura d. Venezie 1958 : **12** : 214–22.

In the Venetian provinces of northern Italy hybrid maize has been relatively unsuccessful on account of its inferiority to the local variety Marano Vicentino in grain quality, particularly for making polenta [cf. XXVIII, 2945], and in earliness, resistance to corn borer and content of fat, protein and carotene in the grain. Top crosses were made of a number of inbred lines of Marano Vicentino, the best lines have been intercrossed and the best hybrids used for the formation of double crosses. Two of them proved particularly promising, and in the period 1955–57 matured 2–3 days before Marano Vicentino and 7–8 days before Wisconsin 355; their grain yield varied from 63·7 to 78·8 c. per ha. compared with 54·3–65·6 for Marano Vicentino and 66·5–76·2 for Wisconsin 355. Under rather unfavourable growing conditions in 1957 one of the hybrids yielded 66·598 c. per ha. as against 56·813 c. from Marano Vicentino and 55·384 c. from Wisconsin 355.
The two hybrids, which are described, have been named Italo 225 and Italo 268. Both have flint grain, orange-yellow in colour, and both are resistant to stalk breakage, lodging, smut, corn borer and drought.

2592 Trentin, A.
Ibrido di granoturco a granella vitrea rossa. (**A maize hybrid with red flint grain**).
G. Agric. 1959 : **69** : p. 75.

Referring to recent accounts [1475] of the red flint hybrid Ibrido Maliani [Maliani's Hybrid], the author mentions three hybrids produced at the Genetics Institute at Lonigo which also have red flint grain of the Marano type. One of them, Italo 225, is several days earlier than Maliani's hybrid and yet exceeded it in grain yield in tests in several localities in 1958. In all tests its yields have been considerably greater than that of Marano itself. [Cf. 2591.]

2593 Bálint, A.
A heterózis genetikai és fiziológiai alapjainak néhány kérdéséről a növényvilágban. (**On some questions of the genetical and physiological foundations of heterosis in plants**).
Magyar tud. Akad. Agrártud. Oszt. Közl. 1958 : **14** : 309–29.

The view is expressed that heterosis cannot be explained on the basis of the gene theory but is explicable in terms of the theories of Mičurin and Lysenko. Among several factors influencing the expression of heterosis in maize are (1) biochemical and physiological differences in the gametes and (2) the environment in which the hybrid is grown. Metaxenia was also found to play a part.

2594 Singh, R. D.
Genetic similarity of related second cycle lines of maize.
Indian J. Genet. 1958 : **18** : 41–48.

Twenty S_6 lines developed by inbreeding and selection of the double hybrid Ohio M15 [(Oh.26 x Oh.51) x (Ill.A x W230)] were crossed with the parent inbreds and six other testers at the Farm Crops Department, Michigan State University, to determine the degree of genetic relationship among the second-cycle lines and between these lines and the parent inbreds. All the lines were genetically diverse from one or more of the parents, as indicated by low yields in cases of genetic similarity to a parent and higher yields in cases of disparity. Some lines were genetically similar while others behaved as though unrelated. According to the correlations for yield among the lines, it is more likely that genetically different lines will be obtained as the result of second-cycle breeding. In general, the lines were genetically close as regards moisture percentage and resistance to stalk lodging. Seven second-cycle lines, the four parent inbreds and the unrelated line M14 were used to produce 66 single crosses. Actual and predicted performances of double hybrids derived from these single combinations were compared with the performance of Ohio M15. A few double crosses obtained by crossing four second-cycle lines or by replacing one or

more of the original parents by second-cycle lines were equal to or, in one case, slightly better than Ohio M15 in yield. Predictions of yield, percentage moisture and resistance to stalk lodging were significantly correlated with actual values. The results indicated that lines of the same origin may be used to produce hybrids, provided they are extracted from a genetically heterogeneous source, such as the double cross investigated.

2595 Bätz, G.
Die Silomais- und Grünmaissorten für den Anbau in der DDR 1959. (Silage maize varieties and green maize varieties for cultivation in the German Democratic Republic, 1959).
Dtsch. Landw., Berl. 1959 : **10** : 108–10.
Descriptive notes are provided on varieties from Germany, the USSR, Hungary and Bulgaria; these varieties have been thoroughly tested in the German Democratic Republic.

2596 Bianchi, A.
An excellent material for cytogenetic studies from maize-teosinte derivatives.
Genetica 1959 : **29** : 327–30.
In the course of studying maize-teosinte derivatives segregating for defective kernel factors, a strain was found whose chromosomes were so well spread out in pachytene smears that they provided very good material for cytogenetical work. If the good spreading qualities of the chromosomes are found to have a genetic basis, attempts will be made to produce a strain homogeneous for this character.

2597 Haskins, F. A., Davidson, M. F. & Beers, R. J.
Influence of seed irradiation with X rays and thermal neutrons upon cell size and mitotic activity in root tips of maize.
Amer. Nat. 1958 : **92** : 365–69.
Maize grains were treated with X rays or thermal neutrons and the cell size, mitotic activity and nucleic acid content were determined. The dosage levels did not affect cell width but small increases in cell length were associated with increasing dose of X rays or thermal neutrons. The treatments greatly reduced mitotic activity. The amount of RNA per root tip tended to decrease with increasing dose of radiation but no consistent relationship was found between DNA content and the dose.

2598 Emmerling, M. H.
Evidence of non-disjunction of abnormal chromosome 10.
J. Hered. 1958 : **49** : 203–07.
A study was made of the effects of the knobbed type of chromosome 10 of maize upon the frequency of nondisjunction, as indicated by the frequencies of trisomes, isochromosomes and translocations. Two closely linked components of the *R* complex were used as genetic markers for the detection of nondisjunction. Nondisjunction occurred only in plants heterozygous for knobbed chromosome 10. Possibly the neocentromeric activity of this abnormal chromosome may cause the anaphase chromosomes to migrate irregularly to the poles and may occasionally also lead to breakage as the result of the mechanical strains imposed by the precocious movement of the neocentromeres towards the poles. The higher frequency of aberrations formed in plants homozygous for knobbed chromosome 10 than in heterozygotes may also be attributable to neocentromeric activity.

2599 Turcotte, E. L.
A cytogenetic study of certain translocation intercrosses involving the same chromosome in maize.
Diss. Abstr. 1958 : **19** : LC Card Mic 58–2166 : 25–26. (Abst.).
Five crosses between translocation stocks involving the same two chromosomes but with the breakage points at different positions were investigated: T2–6c x T2–6d, T3–7a x T3–7b, T1–9a x T1–9c, T2–6B x T2–6(6049) and T1–7a x T1–7b. The first three were studied genetically and cytologically and the remaining two only genetically. In testing genetically for deficiency, the intercrosses were crossed as ♀ parents with plants containing recessive markers presumed to be situated at or near the loci involved in the translocations. Plants in the progenies of back crosses with a degree of sterility comparable to that of the F_1 were used also as ♀ in crosses with the recessive testers. Genetic evidence of the functional capacity of deficient ♀ gametes was obtained from T3–7a x T3–7b and T1–9a x T1–9c. The F_1 of the former cross and progeny of similar type from the back crosses, when crossed as ♀ with a floury-2 tester (*fl*$_2$), produced floury kernels. The percentages were 7·6 from the F_1, 7·7 from the back cross to T3–7a and 1·7 from the back cross to T3–7b. This indicated that *fl*$_2$ is probably either in the short arm of chromosome 3 or the long arm of chromosome 7. When crossed as ♀ with an argentia tester (*ar*), the F_1

of T1–9a x T1–9c produced 10·5% argentia progeny, and the back crosses to T1–9a and T1–9c respectively 16·5 and 15·8%. These results indicated that the segment of the long arm of chromosome 9 containing the normal allele of *ar* was missing. The results of other genetic tests for deficiencies were negative. Diacinesis in all the F_1s showed 10 "bivalents". In T3–7a x T3–7b a "bivalent", probably chromosome 7^3, with homologues of unequal length, was observed in some cells. T2–6c x T2–6d showed no loops in either chromosome 2^6 or 6^2 at pachytene. Average pollen abortion in the F_1 was 7·3%. These results suggest that the breakage points of T2–6c and T2–6d are identical or nearly so. This is in disagreement with the published reports concerning the breakage positions of these two translocations. In T3–7a x T3–7b, T-shaped configurations were found for both chromosomes 3^7 and 7^3 at pachytene, while in T1–9a x T1–9c intercalary loops were observed in both chromosomes 1^9 and 9^1. Pachytene analysis of *ar* progeny derived from the genetic tests of T1–9a x T1–9c showed H-shaped complexes, the presence of nonhomologous segments thus being indicated. The lack of homology was interpreted as being due to a duplication and a deficiency for intercalary segments of chromosomes 1 and 9 respectively.

2600 Tarkowski, Cz.
Poliploidy *Zea mays* L. (**Polyploids of *Z. mays* L.**).
Postępy Nauk Roln. 1957 : **4** : No. 2 : 65–68.

Work on maize polyploids is reviewed, with particular reference to investigations by B. McClintock and L. F. Randolph.

2601 Lebedeva, Z. V.
(**The effect of foreign pollen on the fertilization process in maize**).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1958 : **122** : 512–15. [Russian].

An account of pollination experiments aiming at reduction of the depressing effects of selfing on maize at the Institute of Genetics of the Academy of Sciences [IGAN] is presented. Improvements in grain sets and ear weights were obtained in the varieties Bezenčuk 41 and IGAN by the following methods: fertilizing the plants with self pollen + treble the amount of pollen of another species (rye, hemp, pumpkin or sunflower); (2) adding treble the amount of hemp or sunflower pollen previously sterilized by 96% alcohol to self pollen, or (3) spraying maize flowers previous to selfing with a 1×10^{-9} aqueous solution of α-naphthylacetic acid amide. IGAN was found to be more susceptible to the depressing effects of selfing than Bezenčuk 41, but it also responded by more noticeable improvements in grain set and ear weight to the above treatments. The addition of rye pollen to self pollen was the most effective method in the case of Bezenčuk 41 while the addition of sunflower or pumpkin pollen was best in the case of IGAN. Although addition of rye, pumpkin, hemp or sunflower pollen to self pollen promoted grain setting and ear development in both maize varieties, self pollen + a pollen mixture comprising all four plant species was more depressive than self pollination alone. This is attributed to antagonism between the components of the mixture and possibly also between the components and the pistil. Self pollen + sterile pollen of hemp or sunflower or spraying with α-naphthylacetic acid amide previous to selfing also improved grain setting, but less noticeably than the treatments with viable pollen.

2602 Bocanegra S., S.
Resultados de los experimentos del programa de maíz de la Estación Experimental Agrícola de La Molina. Campaña 1956–57. (**Results of experiments in the maize programme of the Agricultural Experimental Station of La Molina. Season 1956-57**).
Inf. mens. Estac. exp. agríc. La Molina 1958 : **32** : No. 371 : 7–14. (Mimeographed).

Production and testing of inbred lines, single crosses and top crosses continued [cf. XXVIII, 435]. Male sterility has been transferred from American lines to Peruvian material. Tables are included showing the yields of top crosses involving the variety Sintético La Molina 5; several yielded more than 5000 kg./ha. and surpassed the control by 30%.

2603 Jones, D. F., Stinson, H. T. (Jun.) & Khoo, U.
Pollen restoring genes.
Bull. Conn. agric. Exp. Sta. 1957 : No. 610 : Pp. 43.

An historical survey of cytoplasmic pollen abortion and restoration in maize is given. Experiments were made to ascertain the seasonal differences in pollen restoration in the F_2 generation of crosses of restoring inbreds. In unfavourable seasons two restoring genes are needed for plants to show any anthers but in favourable seasons only one restoration gene is

necessary. Data on the segregation of pollen-restoring genes in inbreds used as pollen parents and seed parents are presented. Of the three restoring inbreds used as pollen parents Tx 127 gave rise to segregation in a 9 : 7 ratio; Ky21 and NC77 gave 3 : 1 ratios. Of the inbreds used as seed parents with these pollinators, NF9T and 33–11T gave a 9 : 7 segregation ratio while C106T, KysT and K4T gave a 3 : 1 ratio. These results indicate differences in the number of restoring genes involved in the crosses. The segregation of fertile and sterile plants in back-crossed progenies is found to be quite different in many inbreds. Further proof is given that pollen restoration is due to genes in the chromosomes and that there are separate genes capable of restoring T cytoplasm independently. Information on pollen production in sterile inbreds restored by line Ky21 and crossed to sterile inbreds, single crosses and restored sterile inbreds is discussed, together with information on various inbreds which either bring about complete restoration or effect partial restoration. Inbreds of the latter type are very erratic in their performance and are subject to environmental influences.

There are indications that sterile hybrids have a higher yield than fertile hybrids. The yield and other agronomic characters of restored sterile hybrids appear to be quite promising. Pollen-restored inbreds are tabulated and the method of using them as sources of restoring genes is discussed.

2604 Anderson, R. A. & Pfeifer, V. F.
A note on experimental wet-milling of high-amylose corn.
Cereal Chem. 1959 : **36** : 98–101.

Ways in which starch-gluten separation may be improved in the wet-milling of breeders' samples of maize with high-amylose starch are indicated.

2605 Nakamura, N.
(On the growth rate of maize endosperm after various pollination treatments).
Hyogo Noka Daigaku Kenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. : 1953 : **1** : No. 1 : 13–16. [Japanese].

Growth rate of the endosperm, estimated by number of nuclei, was determined for two different varieties acting as mother plants. The silks of the ears were divided into three bundles to which were respectively applied pollen from two other varieties and self pollen. In all cases, endosperm growth rate was slowest with self pollen. It was noted that endosperm growth rate was higher in the combination A34 x A111 than in A34 x ND283; however, endosperm growth rate appeared not to be correlated with degree of heterosis for grain yield and plant height.

2606 Michna, M. & Szwadiak, J.
Wpływ głębokości siewu na transpirację i plon zielonej masy u kilku odmian kukurydzy. (**The influence of depth of sowing on transpiration and crop yields of green matter in some maize varieties**).
Roczn. Nauk rol. : Ser. A : 1957 : **75** : 267–72.

At the School of Agriculture, Poznań, Poland, transpiration and yield of green matter were investigated in eight varieties sown at depths of 3, 5 and 10 cm. A depth of 10 cm. resulted in good yields in Przebędowska Biała [Przebędowo White] but was the least favourable for the other varieties, most of which gave their best yields when sown at 5 cm.

2607 Daya Krishna Misra
Drought resistance in plants when grown at different moisture levels and rate of transpiration.
Indian J. Agron. 1957 : **1** : 167–75.

In greenhouse experiments on the maize hybrids K1784, K1639, K2234 and K1830 at Kansas State College, ability to resist soil drought was influenced by previous moisture content of the soil [cf. XXVII, 3888 and 4010]. Recovery of plants grown with a moisture supply equivalent to that occurring under field conditions was very poor, but with a supply one-third of this amount rate of recovery was comparatively high. In drought resistance, K2234 was superior to K1639, which was in turn less susceptible than K1784 and K1830. The four hybrids did not however differ in transpiration rate.

2608 **Functional characteristics of some inbred lines of corn.**
Progr. Rep. Pa. agric. Exp. Sta. 1958 : No. 196 : unpaginated.

Information is given on maize inbreds used for hybrid production in Pennsylvania with respect to such characters as root and stalk strength, disease and insect resistance and tolerance of drought and Mg deficiency.

2609 Respondek, V.
Chemische Mutationsauslösung beim Mais. (**The chemical induction of mutation in maize**).
Naturwissenschaften 1958 : **45** : p. 555.

At the General Research Institute for Agriculture, Bogor, Indonesia, plants of *Zea mays*

var. *durum* were treated with solutions of N/500 $AlCl_3$, N/200 KCl, N/100 ethylurethane and N/20 glycol. The chemicals were introduced into the plants through a cut in the stem; the treatment, which started shortly before meiosis began, lasted for three to five days.
These treatments caused only slight disturbances in the development of the plants. Selfing was effected. It was found that all the treatments caused some sterility in both male and female flowers. There was an average grain set of 30% in the treated plants.
Many seedlings of the C_1 generation and especially those descended from plants treated with $AlCl_3$ showed chlorophyll defects. Also all the treatments caused some morphological defects in this generation. Many mutants were found in the C_2 generation but most of them were of no breeding value. However the progeny of one plant treated with $AlCl_3$ showed marked resistance to *Sclerospora maydis*. A line was selected which has remained almost free of infection during testing.

2610 Ehrlich, H. G.
Nuclear behavior in mycelium of a solopathogenic line and in a cross of two haploid lines of *Ustilago maydis* (DC.) Cda.
Mycologia 1958 : **50** : 622–27.

The solopathogenic line 410qq and the haploid lines $10A_4$ and $17D_4$, which were the parents of 410qq, were typically uninucleate in artificial culture. Line 410qq in the host, *Zea mays* 'Marcross', was also characteristically uninucleate. Mycelia resulting from the cross between 10_4 and $17D_4$ in the host were initially uninucleate. A progressive increase in the percentage of dicaryotic cells was however observed until 11 days after inoculation. The trend was then reversed and uninucleate cells again predominated. The changes in nuclear condition were interpreted as being due to dicaryotization, followed by nuclear unions. Caryogamy occurred prior to recognizable chlamydospore formation.

2611 Russell, W. A. & Hooker, A. L.
Inheritance of resistance in corn to rust, *Puccinia sorghi* Schw., and genetic relationships among different sources of resistance.
Agron. J. 1959 : **51** : 21–24.

Each of six maize lines studied at the Wisconsin and Iowa Experiment Stations was found to carry a dominant gene conferring resistance to *P. sorghi*. These genes are different as indicated by the different reactions of the six maize strains to a series of biotypes of the pathogen. Studies of resistant x resistant F_2 progenies using a single rust culture indicated that the genes for resistance are either in an allelic series or involve different but closely linked loci. Some F_3 analyses of crosses among resistant lines showed that if more than one locus is involved, the crossing over is probably less than 5%.

2612 Storey, H. H. & Howland, A. K.
Resistance in maize to the tropical American rust fungus, *Puccinia polysora*. II. Linkage of genes Rpp_1 and Rpp_2.
Heredity 1959 : **13** : 61–65.

Pure lines carrying Rpp_1 and Rpp_2 were crossed. The progeny gave the characteristic reaction determined by Rpp_1 when tested with the rust race EA1 and the Rpp_2 reaction when tested with EA2 [cf. 351]. The segregation data indicated that the two genes are linked with a recombination frequency of 12·23%, the confidence limits ($P = 0{\cdot}05$) being 9·10 and 15·37%. From the F_3 generation, families carrying both dominant genes were selected.
In some cases minor genes appear to modify the effect of Rpp_2 to full susceptibility.

2613 Syamananda, R. & Dickson, J. G.
The influence of temperature and light on rust reaction of inbred lines of corn inoculated with specific lines of *Puccinia sorghi*.
Phytopathology 1959 : **49** : 102–06.

The rust reaction of eight inbred lines of maize to one or more uredial clonal lines was studied at constant temperatures of 16, 20, 24 and 28° C. and at alternating and day and night temperatures of 28 and 20° C, and 24 and 16° C. in an attempt to evaluate the inbred lines for use as differential hosts. The influence of light on rust reaction was also investigated for two inbred lines of maize. Inbred lines GG208R and B38, both with single, dominant genes conditioning resistance to the cultures of the pathogen used, were resistant at 16, 20 and 24° C. At 28° C., GG208R was resistant to uredial line 1–20 and only moderately resistant to line 921. B38 was highly susceptible to line 904 at 28° C. and resistant when grown at day and night temperatures of 28 and 20° C. The inbred lines B14 and 156 were susceptible at all the temperatures studied. The inbred line Pop 35, with two recessive gene pairs conditioning rust resistance, reacted differently to

four lines of the pathogen at the four different temperatures.

2614 Ullstrup, A. J.
A study of the nature of intraspecific aversion in *Diplodia maydis*.
Bull. Torrey bot. Cl. 1958 : **85** : 397–404.
Evidence has been obtained that incompatibility between cultures of *D. maydis* is due to the production of a toxin.

2615 Jenkins, M. T. & Robert, A. L.
Evaluating the breeding potential of inbred lines of corn resistant to the leaf blight caused by *Helminthosporium turcicum*.
Agron. J. 1959 : **51** : 93–96.
Thirty inbred lines resistant to leaf blight were each crossed with three susceptible inbred testers. The lines, testers and F_1 and F_2 generations were then evaluated for their reactions to the disease under conditions of heavy natural epidemics, the plants being scored individually. Highly significant differences were found among the resistant lines and among the susceptible testers. Analysis of the F_1 and F_2 data indicated that the variances for lines, testers and lines x testers were highly significant. It is concluded that probably the percentage of highly resistant plants in the F_2 offers the best means of appraising the potential breeding value of resistant lines. Lines showing promise in this respect were GE440, CI90A, CI93A, Wh4971, CI86A, CI28A and Ky114.

2616 Smeltzer, D. G.
Relationship between fusarium ear rot and corn earworm infestation.
Agron. J. 1959 : **51** : 53–54.
Tests conducted at Davis, Calif., on 20 maize varieties, revealed that when infestation by *Heliothis obsoleta* is reduced by the application of DDT, there is also a reduction in kernel damage caused by *F. moniliforme* (*Gibberella fujikuroi*). Of the ears infested by worms, 26·5% had ear-rot damage but only 7% of the ears without worms were damaged by ear rot. It is concluded that the reaction of maize varieties to *F. moniliforme* cannot be evaluated accurately without considering also the level of infestation by *H. obsoleta*.

2617 Bertels M., A.
Pragas do milho, métodos de defesa. **(Maize pests, methods of protection).**
Bol. téc. Inst. agron. Sul 1956 : No. 16 : Pp. 18.
Among the examples quoted of promising genetic sources of resistance to insect pests are the so-called bitter maizes, resistant to *Laphygma frugiperda*, and pigmented maize, resistant to *Diatraea saccharalis*.

2618 Fleming, A. A., Singh, R., Hayes, H. K. & Pinnell, E. L.
Inheritance in maize of reaction to European corn borer and its relationship to certain agronomic characters.
Tech. Bull. Minn. agric. Exp. Sta. 1958 : No. 226 : Pp. 32.
In order to determine the importance of differential reaction to early feeding, lines from crosses between Minnesota inbreds and resistant inbreds from other states were studied in replicated trials in 1949 under heavy manual infestation. The lines were classified as resistant (R), intermediate or susceptible (S) according to overall damage and the extent of injury from early leaf feeding by the first-brood larvae. Wide differences in borer injury were noted between the resistant and susceptible groups of inbreds. R x S crosses were intermediate to R x R and S x S in reaction to leaf feeding and overall damage. Crosses which were resistant to leaf feeding were also resistant to overall injury. Certain S inbreds and their crosses were definitely superior in yielding ability. Under conditions of infestation R x R crosses yielded, on the average, about the same as R x S and slightly less than the S x S crosses. Under conditions of noninfestation, the R x R crosses had the lowest yield but this may be partly explained by the lack of genetic diversity in some of the crosses. Studies of various agronomic characters of the inbreds and crosses were made on infested and noninfested plots. Selection for resistance or tolerance to the first-brood infestation of the European corn borer does not appear to be difficult. The data on heritability for leaf feeding and overall damage indicate that resistant inbreds can be selected from crosses of R x S parents.
The inheritance studies included two experiments, in each of which a relatively resistant inbred, a susceptible inbred, their F_1 and F_2 and two back-cross progenies were planted in a randomized-block design. Results are similar for both experiments, in that relatively few major genes appear to control resistance to leaf feeding and overall damage by the first brood of borers. In the first experiment, partial phenotypic dominance was shown in the F_1 hybrid (A357 x F1235) for both leaf resistance and overall damage. Hybrid vigour appeared to influence the amount of resistance in the F_1 generation. In the second experiment, the F_1 (A291 x A279) and back cross to the resistant

parent showed an intermediate phenotypic effect for both leaf feeding and overall damage. The F_2 and back cross to the susceptible parent showed partial dominance for susceptibility. The genes controlling resistance may not be the same in the two crosses studied. If they are the same, these results could be explained on the basis of expression of two major genes or their equivalents in different genetic backgrounds.

2619 Everett, T. R., Chiang, H. C. & Hibbs, E. T.
Some factors influencing populations of European corn borer [*Pyrausta nubilalis* (Hbn.)] in the North Central States.
Tech. Bull. Minn. agric. Exp. Sta. 1958 : No. 229 : Pp. 63.

A project, which included the study of the effect of first and second brood borers upon two hybrids, Oh43 x Oh51A (resistant) and WF9 x M14 (susceptible), was carried out in Iowa, Minnesota and Ohio. Fewer first-brood larvae survived in the resistant hybrid than in the susceptible hybrid in every year, in every state and in both early and late planted maize. The resistance factors in Oh43 x Oh54A were not as effective in reducing second-brood infestations as first-brood infestations, but both first and second brood borer infestations did less damage on the resistant hybrid than on the susceptible hybrid. The reduction of yield in the two hybrids was more consistently associated with first-brood than second-brood infestations in Iowa and Minnesota but the reverse was found to be true in Ohio.

BARLEY

2620 **Barley variety trials in north east Scotland 1952-58.**
Bull. N. Scot. Coll. Agric. 1959 : No. 5 : Pp. 8.

A summary is presented of the results of trials of Scandinavian and English barleys at Craibstone Farm, Aberdeenshire. Depending on the level of soil fertility, varieties considered to be promising as fodder barleys were Ingrid, Ymer, Herta, Proctor, Carlsberg and Maythorpe. The last three were also considered to be suitable for malting purposes.

2621 Saloheimo, L.
Ohra vaara- ja suoviljelyksillä. (**Barley cultivation on mountain and peat land**).
Keotoiminta ja Käytäntö 1958 : **15** : p. 18.

The performance of four varieties is compared on mountain land and peat soil. In all cases the yield and the grain size is somewhat greater in the former habitat. Pirkka is most strongly recommended for cultivation in Central Finland, while Balder is the best two-rowed barley for mountainous regions, but is particularly demanding of lime.

2622 Anttinen, O.
Eräistä uusista aikaisista ohralajikkeista. (**On some new early varieties of barley**).
Maatalous ja Koetoiminta 1958 : **12** : 104–08.

The new Swedish varieties Edda II and Åsa compared favourably with the Finnish varieties Tammi and Pirkka in trials at the North Poljanmaa experimental station, having good productivity and superior strength of straw. Two Finnish strains, Jo0660 and Ta a 8098, compared favourably with Tammi for yield but had a rather longer growing period. Their strength of straw is less than in the Swedish varieties.

2623 Zomergerst, 1959. (**Summer barley, 1959**).
Landbouwvoorlichting 16 : Bijl. 36; Ber. Rassenkeuze 1959 : No. 253 : Pp. 4.

Brief descriptions of 24 varieties grown in the Netherlands are presented, together with notes on their yields on different soil types.

2624 Pinthus, I. [Y.]
(**Strain selection in barley**).
Sadeh (Field)/Hassadeh 1958 : **38** : 1067–68. [Hebrew].

Four strains have been selected from the cross Nisanit x Bi-em-si. They are promising in respect of yield, grain size and standing capacity.

2625 Lotošnikov, D. A.
(**For speedier improvement of the system of seed production**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. **4** : p. **33**. [Russian].

Slow introduction of the high-yielding barley Donec 650, which has good forage properties, is cited as an example of shortcoming of the present system of testing and multiplication of new varieties. Donec 650, bred at the Kamenskaja Research Station, Rostov province, was submitted for trials six years ago, yet there is still not enough seed for supplying farms.

2626 Scholz, F. & Lehmann, C. O.
Die Gaterslebener Mutanten der Saatgerste in Beziehung zur Formenmannigfaltigkeit der Art *Hordeum vulgare* L.s.l. I. (**The Gatersleben mutants of grain barley in relation to the variety of form in the species *H. vulgare* L.s.l. I**).
Kulturpflanze, Berlin 1958 : **6** : 123–66.

The large collection of X-ray-induced mutants at Gatersleben shows a multiplicity of form resembling that found amongst naturally occurring barleys. The morphology of the mutants is being studied and compared with that of natural forms, attempts being made to classify the mutants according to a morphological system [cf. XX, 1644]. In this paper 75 mutants of the spring barleys Ackermanns Donaria and Haisa are described; 71 of the mutants were placed in 17 different varieties; four could not be classified.

Four of the mutants are placed in convar. *hexastichon* var. *hybernum*; these are all characterized by their four-rowed ears; two of the mutants also have wide leaves. A fifth mutant of var. *crispum* has a branched ear. The mutants in convar. *distichon* var. *nutans* are as follows: seven with large grain; two with waxless culms; five with waxless leaves; one with wide leaves; six with short culms and narrow leaves; two with short ears; two with semi-naked grain; one with bent internodes; one with a single culm and one with the segments of the ear axis irregularly shortened. Of the three mutants in var. *medicum*, one has smooth awns and two semismooth awns. In var. *subnutans*, there are six mutants with short awns. A mutant with the lemmae having a sac-like appendage is placed in var. *calcaratum* and in var. *angustispicatum* there is one having a lemma with a three-pronged appendage. Two mutants with wide and awned glumes are assigned to var. *gustafssonii* and five with dense ears to var. *erectum*. All of the seven mutants in var. *breve* have very dense ears and one mutant placed in var. *heteroglumatum* has also very dense ears and the empty glumes of the lateral spikelets are unequal. In var. *nudum* are two mutants with naked grain, one with large grain and one with the culm free of wax. The var. *subnudum* has a mutant with short awns and var. *gymnocrithum* one with very dense ears. One mutant having long lateral branches to the ears and two with corresponding short lateral branches are assigned to var. *compositum*.

In convar. *deficiens*, a smooth-awned mutant having the lateral spikelets reduced is placed in var. *glabrideficiens*, whilst in var. *rehmii* there is a mutant with lateral spikelets reduced and wide and awned glumes.

To convar. *labile* var. *crispum-haxtoni-compositum* is assigned a mutant in which the fertility of the lateral spikelets varies and there is a tendency to produce only one culm.

The four unclassified mutants have lateral spikelets which vary both in respect of fertility and awning.

2627 Heslot, H., Ferrary, R., Lévy, R. & Monard, C.
Recherches sur les substances mutagènes (halogeno-2 ethyl) amines, dérivés oxygénés du sulfure de bis-(chloro-2 éthyle), esters sulfoniques et sulfuriques. [**Investigations on the mutagenic substances (halogen-2 ethyl) amines, oxygenated derivatives of bis-(chloro-2 ethyl) sulphide and sulphonic and sulphuric esters**].
CR Acad. Sci., Paris 1959 : **248** : 729–32.

Among 17 substances of the above groups, synthesized and tested for mutagenic effect on the barley Rika, ethylmethane sulphonate was able, because of its low toxicity, to induce mutation frequencies of up to 50%.

2628 **Varieties of barleys.**
Fmrs'. Leafl. nat. Inst. agric. Bot. 1959 : No. 10 : unpaginated.

Information is given on varieties recommended as the result of trials carried out by the National Institute of Agricultural Botany, Cambridge, England.

2629 Buchli, M.
Anbauversuche mit Winter-gerstensorten 1956–1958. (**Cultivation trials with winter barley varieties, 1956-1958**).
Mitt. schweiz. Landw. 1958 : **6** : 171–75.

The results are reported of trials conducted at Zürich-Oerlikon with 10 varieties, including foreign barleys. Hauters Wintergerste [Hauter's winter barley], Dea and Firlbeck 1 gave the highest yields of grain.

Hauters Wintergerste has been provisionally included in the Swiss Official List. Bred by D. Hauter of Dreihof, Pfalz, this variety comes from the complex hybrid (Ragusa x Peragis 12) x (Heils H1 x Friedrichswerther x Tschermaks Zweizeilige [Tschermak's Two-rowed]), this cross having been back crossed to (Ragusa x Mahndorfer Viktoria) x (Bolivia x Ragusa) in order to incorporate mildew resistance. Hauters Wintergerste is a four-rowed variety of good standing capacity and early maturity. It is said to be resistant to rust and mildew but is

susceptible to *Helminthosporium gramineum.* This variety also winters well. Its yield of straw is rather low.

2630 Inamura, H. *et al.*
(The breeding of the new early barley Musashinomugi).
Kantotosan Nogyo Shikenjo Kenkyu Hokoku/J. Kanto-Tosan agric. Exp. Sta. 1958 : No. 11 : 36–48. [Japanese].

The above variety is a selection from a cross between the semibrachytic barley Sekitorisai 1 [Saitama Champion 1] and Aizu 6. It is four days earlier than Sekitori but the date of culm elongation is similar; it is resistant to mildew and lodging.

2631 Rico M., E.
El desarrollo de la variedad de cebada "Funza". **(The development of the barley variety Funza).**
Agricultura trop. 1958 : **14** : 633–35.

The use of the new variety Funza in Colombia [cf. 1304] has led to yield increases of 50%, a 15% reduction in cultivation period and a noticeable improvement in malting and brewing quality.

2632 Kuznecov, V. S.
(The malting-barley variety Crimean 65).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 5 : 63–64. [Russian].

Crimean 65 was selected for drought resistance from a local variety at the Crimean Agricultural Research Station. It is a spring barley more productive of grain and straw than the standard variety Crimean 17 and is superior to the latter in malting quality and resistance to *Ustilago hordei*, *U. nuda* and *Helminthosporium.* Having a tough rachis it does not shed grain when harvesting is delayed.

2633 Ključareva, M.
(New facts on the fertilization of barley).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1958 : **123** : 1128–30.

In the studies of the barley Pallidum 17 at the Institute of Genetics of the USSR Academy of Sciences, it was observed that more than two sperm cells reached the cavity of the embryo sac. No surplus sperm cells were seen at fertilization of the egg, but they were always present at the prophase and metaphase of the first subsequent division. During the early postfertilization stages, other pollen tubes emptied their contents into the embryo and endosperm, thus, it is thought, exercising an hereditary influence similar to that reported in experiments on multiparental pollination.

2634 Jain, H. K. & Mujumder, P. K.
Fractionated X-ray dose and chromosome aberrations in barley.
Curr. Sci. 1959 : **28** : 8–9.

Resting cells in root tips were exposed to a dose of 2400 r. applied continuously or divided into two equal fractions separated by 2, 4, 6 and 8 hr. When the fractionated dose was given with an interval of 2 hr., the frequencies of reunions (dicentrics and centric rings) and breaks (acentric fragments and "minutes") were considerably reduced in comparison with those obtained with the continuous dose. With an interval of 4 hr., the reduction was less pronounced. With still further increase of the interval, the aberration frequencies approached those resulting from the continuous dose. It was established that possible differences in chromosome sensitivity to structural change at different stages during the resting phase did not play a significant part in the alteration of the frequencies of breaks and reunions by fractionation. The results give support to the hypothesis that breaks may remain open for several hours.

2635 Caldecott, R. S.
The effects of X-rays, 2-mev electrons, thermal neutrons, and fast neutrons on dormant seeds of barley.
Ann. NY Acad. Sci. 1955 : **59** : 514–35.

Treatment of dormant seeds of Himalaya barley with radiations of high specific ionization (thermal and fast neutrons) had a more uniform effect, as evaluated in terms of growth inhibition and survival, than exposure to radiations with a low specific ionization (X rays and 2-mev electrons). In the case of both X rays and thermal neutrons, the frequencies of chromosomal interchanges and dose were linearly related. The linearity in both cases may be interpreted on the basis of densely ionizing electron tails causing apparently simultaneous fracturing of two chromosomes for which the probability of exchange is high. Per unit survival, more than twice as many interchanges resulted from irradiation with thermal neutrons as with X rays. It is concluded that a greater proportion of the lethal action of X rays is caused by extrachromosomal events than is the case with thermal neutrons. For both X rays and thermal neutrons, the relationship between frequency of seedling mutations and dose was linear. As many seedling mutations per chromosome break (based on frequency of interchanges)

were induced by X rays as by thermal neutrons. It is therefore suggested that the two kinds of radiation incited mutations in the same way, these probably resulting from numerous ion pairs at a locus and possibly having their origin in intrachromosomal or interchromosomal rearrangements.

2636 Tsuchiya, T.
Fertility of autotetraploids and their hybrids in barley, II. Meiosis and fertility in tetraploid hybrids.
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1957 : No. 8 : 27–32.

Meiosis and pollen fertility were studied in hybrids between induced autotetraploids of *Hordeum spontaneum* var. *transcaspicum* and *H. sativum* 'Early Golden Melon' [cf. 357]. In hybrids with $2n = 28$ and a single plant with $2n = 27$, the average configurations at metaphase I were respectively $0{\cdot}7_{I} + 6{\cdot}5_{II} + 0{\cdot}6_{III} + 2{\cdot}9_{IV}$ and $0{\cdot}35_{I} + 7{\cdot}66_{II} + 0{\cdot}1_{III} + 3{\cdot}00_{IV}$ Observations on the autotetraploid parents [cf. 1981], hybrids and the $2n = 27$ individual indicated that seed or pollen fertility was not associated with univalent frequency but that sterility increased in proportion to the frequency of quadrivalents.

2637 Reinberg, E. & Shebeski, L. H.
Fertility of barley autotetraploids. I. Fertility in successive generations of four autotetraploid barley varieties and the effect of selection for fertility in the O.A.C. 21 autotetraploid.
Canad. J. Pl. Sci. 1959 : **39** : 98–107.

The differences in seed fertility of colchicine-induced tetraploids of Brant, Montcalm, OAC21 and York were compared in the C_1–C_4. Despite a wide range in percentage of fertility within the tetraploid form of each variety, the tetraploid varieties tested differed considerably in mean fertility. Within the tetraploid of each variety, the mean fertility remained relatively constant from generation to generation, although influenced to a certain extent by the environment. The tetraploid of Montcalm had the lowest mean fertility, fluctuating from generation to generation within a range of 6·0 to 10·1%. The OAC21 tetraploid had the highest mean fertility, fluctuating within a range of 40·0 to 51·3%. The significant and relatively constant disparities in fertility of the four tetraploids are interpreted as indicating that seed-setting ability may be genetically controlled. Continuous selection for either high or low fertility from the C_1 to C_4 in the OAC21 tetraploid did not bring about any significant change in mean fertility. It is however pointed out that this result may not be representative of the response of tetraploids of other barleys to selection for fertility.

2638 Mechelke, F.
Durch Überdosierung von "Germisan" verursachte Polyploidie. (**Polyploidy caused through overdosing with "Germisan"**).
Kulturpflanze, Berlin 1958 : **6** : 167–77.

Applying strong doses of the seed disinfectant germisan to barley grain was found to induce polyploidy in vegetative but not generative tissues; the effect was similar to that of colchicine. Germisan contains an organic mercury compound.

2639 Ono, H.
(**Morphological studies on a new variant obtained from a six-rowed barley**).
Hyogo Noka Daigaku Kenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. 1955 : **2** : 11–14. [Japanese].

The variant arose spontaneously in the Japanese variety Isejiro [Ise White]. It differs from the type in excessive elongation of the leaves and stems prior to tillering.

2640 Johnson, L. P. V. & Paul, G. I.
Inheritance of earliness in barley.
Canad. J. Pl. Sci. 1958 : **38** : 219–33.

The genetics of heading period was studied in the F_1–F_3 of crosses involving the early varieties Atsel, Beecher and Tulare and the late varieties Frontier, Bonneville and Montcalm. It appeared not to be necessary to treat heading period as a continuously varying character; instead, most of the segregation ratios obtained could be accounted for on a two-factor hypothesis involving additive effects with no dominance, *aabb* being the earliest type and $a_1a_1b_1b_1$ the latest, with four intermediate categories. Minor deviations from expectation are attributed to polygenes.

2641 Bishop, L. R.
Barley dormancy as a varietal characteristic.
J. Inst. Brew. 1958 : **64** : 484–88.

Samples from the barley trials carried out by the Barley Committee of the European Brewery Convention have been analysed with respect to dormancy three weeks after harvest. The

results from samples obtained over a period of six years strongly support the view that the tendency to dormancy immediately after harvest is a varietal characteristic. It is therefore suggested that breeders should aim at developing varieties with the optimum degree of dormancy for the area where they are to be cultivated and should select for this characteristic at an early stage in improvement programmes.

2642 Ono, T. & Suzuki, H.
Endosperm characters in hybrids between barley varieties with starchy and waxy endosperms.
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1957 : No. 8 : 11–19.

Among the 50 varieties tested, Sumiremochi [Violet Glutinous], Bôzumochi [Bonze Glutinous] and HES–4 were found to possess a waxy endosperm, as indicated by the iodine test. As the result of crosses involving $2x$ and $4x$ plants of starchy barleys and these waxy varieties, seeds with $3x$, $4x$, $5x$ and $6x$ endosperms having different combinations of *A* for starchiness and *a* for waxiness were obtained. Dosage of *A* had no influence on the expression of the starchy character, even *Aaaaa* endosperm being starchy. Mosaic endosperms of starchy and waxy tissue, consisting of sectorial or periclinal chimaeras, occurred in seeds resulting from four combinations, three of which involved $2x$ *Hordeum agriocrithon* crosses. The expression of mosaicism was influenced by the numerical relation of *A* to *a* alleles, *Aaa* endosperm having a greater amount of waxy tissue than the *AAa* endosperm.

2643 Mullick, D. B., Faris, D. G., Brink, V. C. & Acheson, R. M.
Anthocyanins and anthocyanidins of the barley pericarp and aleurone tissues.
Canad. J. Pl. Sci. 1958 : **38** : 445–56.

A report is given of a paper-chromatographic analysis of the anthocyanins and anthocyanidins of the pericarp and aleurone of the following varieties: Lion and Gatami (black); Black Hulless and Gopal (purple); Kwan, Montcalm and Trebi (blue); and Golden Pheasant (white). One of the aims of the analysis was the provision of a basis for studying the inheritance of colour in the barley grain. The paper concludes with a discussion of the relationships between the results of the analysis and those of genetical investigations reported in the literature.

2644 Scholz, F.
Mutationsversuche an Kulturpflanzen IX. Über den Rohproteingehalt röntgeninduzierter Gerstenmutanten.
(Mutation experiments with cultivated plants. IX. On the crude-protein content of X-induced barley mutants).
Züchter 1958 : **28** : 289–96.

The collection of induced mutants of barley at Gatersleben, Eastern Germany, numbers 800 different forms [cf. XXVIII, 1653 and XXIX, 2626]. A report is now presented of investigations conducted over several years on the crude protein content of 117 mutant lines. In most cases, the mutants did not show great changes in crude protein content as compared with the corresponding normal forms. Thirteen spring-barley mutants with semismooth awns showed a small increase in yield and in crude-protein content; these mutants were all very similar and probably of the same genotype. Another smooth-awned mutant had a rather lower crude-protein content than the normal form. A few early and large-grained types showed increased protein contents; in these cases, there appeared to be a negative correlation between yield and protein content. Also some short-awned forms were found to have increased protein contents but they were also partially sterile and of low 1000-grain weight.

As regards the winter-barley mutants, an increase in crude protein was found in some long-strawed, late-ripening forms. Earlier mutants did not differ greatly from nonmutant forms in this respect. Mildew-resistant mutants showed protein contents slightly below that of the original variety. Some short-awned types and others with brittle awns had relatively high protein contents but they also had other unfavourable characters.

Amongst all the mutants investigated, marked increases in crude-protein content were only found amongst forms of little or no breeding value.

Questions concerning breeding for high protein content are discussed.

2645 Kitani, K., Inoue, Y. & Shigematsu, Y.
(Studies on white blotch of barley, a nonparasitic disease).
Shikoku Nogyo Shikenjo Hokoku/Bull. Shikoku agric. Exp. Sta. 1957 : **3** : 84–100. [Japanese].

The above disease is caused by potassium deficiency, especially in presence of abundant nitrogen. Comparative trials of a series of

Japanese varieties revealed little in the way of intervarietal differences in susceptibility.

2646 Kitani, K., Inoue, Y. & Shigematsu, Y. **(Studies on internal necrosis of barley, a nonparasitic disease).** Shikoku Nogyo Shikenjo Hokoku/Bull. Shikoku agric. Exp. Sta. 1957 : **3** : 105–24. [Japanese].

The above condition results from magnesium deficiency, especially when potassium is present in quantity. Marked varietal differences in susceptibility were noted, the most resistant varieties being the three naked barleys Ehime 3, Kagoshimawase [Kagoshima Early] and Kagawa 1.

2647 Farrar, L. L. & Stacy, S. V. **Diseases of small grains observed in Georgia during the 1957-58 season.** Plant Dis. Reptr. 1958 : **42** : 1262–67.

Data for the percentage infection of a number of barley varieties by *Helminthosporium gramineum, Ustilago nuda* and *Rhynchosporium secalis* in Georgia in the season 1957–58 are given. Varieties Hudson and Harbine showed complete absence of disease, Wong and Colonial traces only.

2648 Hirata, K. **(Observations on the relation between the infective hyphae and haustoria of barley mildew and the host cells. II. Death of the mesophyll in barley infected by mildew).** Nihon Shokubutsubyori Gakkai Ho/Ann. phytopath. Soc. Japan 1956 : **21** : No. 1 : 23–29. [Japanese].

A comparative study of the course of infection in resistant and susceptible varieties revealed that, in resistant forms, the mesophyll cells underlying infected epidermal cells died whereas in susceptible varieties necrotic effects first became evident some distance away from the pustule. It was also noted that, in resistant varieties, the hyphae sometimes showed signs of derangement even when the underlying mesophyll was uninjured. It is suggested that the death of the mesophyll cells might have been due to diverted nutrient supply.

2649 Pollhamer, E. Lisztharmat rezisztencianemesítési kísérletek tavaszi árpával. **(Experiments on breeding for mildew resistance in spring barley).** Magyar tud. Akad. Agrártud. Oszt. Közl. 1958 : **14** : 331–44.

Among 358 spring barleys inoculated at Martonvásár, Hungary, no Hungarian varieties were resistant but 15 introduced lines showed resistance or immunity. X irradiation of MFB104 yielded 0·2% resistant mutants. Segregation ratios in the F_2 of crosses of the susceptible varieties MFB104 and MFB102 with Halle 4592/51 and Heines Haisa II, indicated that the immunity of Halle 4592/51 is dominant and monogenically determined while the resistance of Heines Haisa II is bifactorially controlled, only doubly recessive plants being resistant.

2650 Moseman, J. G. & Starling, T. M. **Genetics of resistance of the barley varieties Ricardo and Modia to several cultures of *Erysiphe graminis* f. sp. *hordei*.** Phytopathology 1958 : **48** : 601–04.

It was found that one dominant gene in the variety Ricardo determines resistance to cultures BC3, T4, NC9 and VA11 of *E. graminis* f. sp. *hordei*; these cultures came from plants grown in different Canadian and American States. Modia was found to carry a dominant gene conditioning resistance to cultures BC3, CR3, T4, NC9, VA11 and CAN12; Modia also has a second dominant gene responsible for resistance to cultures BC3, CR3 and T4 only. These two genes of Modia are inherited independently.

2651 Grosse-Brauckmann, E. Massnahmen zur Mehltaubekämpfung bei verschiedenen Gerstensorten, ihre Erfolgsaussichten und ihr Einfluss auf den Mineralstoffgehalt. **(Measures for the control of mildew in different barley varieties, their prospects of success and their influence on the mineral content).** Z. PflKrankh. 1958 : **65** : 689–93.

Of the four spring varieties tested in pot experiments at the Institute of Agricultural Chemistry, Bonn University, Weihenstephaner Mehltauresistente [Weihenstephan Mildew Resistant] and Peragis showed high resistance to *Erysiphe graminis*. Resistance was not related to the uptake of nitrogen, SiO_2 or cations of Ca, Mg, K and Na.

2652 Fadrhons, J. Šlechtění ječmene na odolnost proti poléhání. **(The breeding of barley for resistance to lodging).** Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba 1958 : **31** : 1569–78.

Hybrid progenies from crosses of Haná Kargýn ♂ with Balder, Kenia, Freja or Ymer, ♀, showed a 20% improvement in lodging resistance and 8% increase in grain yield, in comparison with

Haná Kargýn at Semčice. Dobrovice 2508/53, a family selected from Balder x Haná Kargýn, greatly surpassed Semčický Hospodařský [Semčice Agricultural] and other approved Czechoslovak varieties in lodging resistance. It was also superior to Semčický Hospodařský in resistance to *Erysiphe*, straw yield and grain quality. Its grain was larger and the straw taller.

2653 Roane, C. W. & Starling, T. M.
Miscellaneous notes on small grain diseases in Virginia.
Plant Dis. Reptr. 1958 : **42** : 1268–71.
Prevalence of *Rhynchosporium secalis* on barley in Virginia is due to preference for Wong over the resistant rough-awned variety Hudson. Comparative data are given for the prevalence of *Pellicularia filamentosa* on a number of barley varieties. Holston is the variety least affected.

2654 Hayes, J. D.
Varietal resistance to spray damage to barley.
Nature, Lond. 1959 : **183** : 551–52.
Commercial varieties tested at the Welsh Plant Breeding Station, Aberystwyth, could be classified according to a clear-cut reaction of resistance or susceptibility to spraying with an insecticide containing DDT. Information on the pedigrees of the varieties and on crosses involving resistant and susceptible parents showed the reaction to spray damage to be heritable. F_2 data indicated that the reaction is monogenically determined with susceptibility dominant to resistance. On several grounds it does not appear that the gene for reaction to such spraying has had any selective influence in previous programmes of breeding.

MILLETS AND SORGHUMS

2655 Fairbrothers, D. E.
Morphological variation of *Setaria faberii* and *S. viridis*.
Brittonia 1959 : **11** : 44–48.
Of the 14 morphological features analysed in wild and greenhouse populations, five quantitative and one qualitative character proved to be satisfactory in distinguishing the weed species *S. viridis* ($2n = 18$) and *S. faberii* ($2n = 36$).

2656 Leal, C. J.
Sorgos escoberos para el noreste. (**Broom sorghums for the north-east**).
Agric. téc. Méx. 1958 : No. 6 : 8, 9, 49.
This general article on the cultivation of broom sorghums in north-eastern Mexico includes data on the yields and agronomic characters of seven varieties tested at the Apodaca Agricultural Experimental Field in Monterrey.

2657 Lazo de la Vega, J. L., Ortegon M., A. S. & Osler, R. D.
Resultados obtenidos con sorgo en El Bajío. (**Results obtained with sorghum in the Bajío**).
Agric. téc. Méx. 1958 : No. 6 : 24–25.
Of varieties and hybrids tested in the Bajío, Mexico, in 1956–57, the best grain yields were given by the Texas hybrids 660, 650 and 620. Until sufficient seed of these is available for distribution, the varieties Kafir 1 and Kafir 60 are recommended.

2658 Lazo de la Vega, J. L. & Osler, R. D.
El cultivo del sorgo de "humedad residual" en la faja costera de Veracruz. (**The cultivation of "residual-moisture" sorghum in the coastal zone of Veracruz**).
Agric. téc. Méx. 1958 : No. 6 : 31–32.
Data are given on the performance of grain and forage sorghums sown in September or early October at the end of the rainy season and depending upon residual soil moisture and isolated showers occurring before the dry season sets in. In the basis of the trial results, the grain sorghums Hegari Precoz [Early Hegari] and Kafir I and the forage sorghum Honey are recommended.

2659 Lazo de la Vega, J. L., Wing M., M. A. & Osler, R. D.
Sorgo de temporal en la zona sur del istmo del Tehuantepec. (**Sorghum for the rainy season in the southern zone of the Tehuantepec isthmus**).
Agric. téc. Méx. 1958 : No. 6 : p. 52.
Rain in the wet season in the above area in Mexico is scant and irregular. In tests conducted in 1954 and 1957 the grain sorghum Hegari Precoz [Early Hegari] was the best variety under these conditions. The hybrid Texas 590 yielded more but was only tested for one year.

2660 Shane, J. F. & Richards, H. R.
Results of the Kentucky grain sorghum performance tests 1958.
Progr. Rep. Ky. agric. Exp. Sta. 1958 : No. 73 : Pp. 11.
The yield, moisture percentage, height, head exsertion, lodging, test weight and number of days after 1 July when 50% of the heads have

emerged from the leaf sheaf of 36 hybrids and varieties at two places in Kentucky are given.

2661 Price, C.
A device for greenhouse and field emasculation of sweet sorghum flowers.
Agron. J. 1958 : **50** : p. 763.

Easy way to breed sweet sorghum.
Agric. Res., Wash. 1958 : **7** : No. 5 : p. 6.
Equipment for emasculation by hot-water treatment has been designed at the US Agricultural Research Station, Salinas, Calif. It consists of a cylinder 3 in. in diameter and 12 in. long, cut longitudinally into two equal halves and having a $\frac{3}{4}$ in. hole in the base. A layer of sponge rubber, attached in grooves round the edges of each half, forms a tight seal when the cylinder is closed round the panicle. The two halves are joined with small hinges at one juncture and by metal straps at the other. Arms, about 3 in. long, are welded to opposite sides of the cylinder. Each arm terminates in a clamp which may be attached to a metal rod, so that the height of the cylinder may be adjusted on ring stands in the greenhouse or on rods driven into the soil in the field. A rubber tube is used to siphon the water from the cylinder. It is usually necessary to wrap a piece of cotton round the part of the peduncle which passes through the hole to adjust for individual differences in diameter. A thermometer is attached to the inside of the emasculator in a position in which it may be easily read from the top of the cylinder. The temperature should be checked at frequent intervals and hot water added if necessary. A temperature of 42–44° C. has proved to be the most satisfactory for a 10-min. treatment.

2662 Reggiani, F.
Il sorgo ibrido sugli arenili di Ostia antica. (**Hybrid sorghum on the sandy soils of Ostia Antica**).
G. Agric. 1959 : **69** : p. 45.
Hybrid sorghums introduced from the USA have remained singularly free from insect attack, and on the sandy soils in the vicinity of Ostia have proved drought resistant and early, maturing grain in 110–115 days. The mean grain yield from 10 hybrids tested was 38 c. per ha., the highest being 42 c. from hybrid S–1, together with 200 c. of fodder. The quality of the grain for forage purposes being roughly the same, the hybrid sorghums are considered preferable to hybrid maize, which under similar conditions yielded only 25 c. of grain per ha.

2663 Thurman, R. L.
Sorghum yield trials, 1957.
Mimeogr. Ser. Ark. agric. Exp. Sta. 1957 : No. 62 : Pp. 5. (Mimeographed).
Of the hybrids of grain sorghum tested in Arkansas during 1957, RS610 and Texas 620 outyielded open-pollinated varieties at all four of the trial centres. Open-pollinated varieties of the forage type, on the other hand, equalled or surpassed hybrids of forage sorghum in green-weight yields.

2664 Veeraswamy, R.
Cholam TPT. 1—an economic mutant of *Talaivirichan Cholam* (*Sorghum roxburghii*).
Madras. agric. J. 1958 : **45** : 407–10.
Cholam TPT1 (*Sorghum roxburghii*) has been released for cultivation in the North Arcot and Salem districts, Madras State, where it has surpassed the local type by 20–30% in grain yield. The variety was developed from a mutant with white pearly grains found at Coimbatore in Cholam Co.2, a strain with white chalky grains. At Coimbatore, the performance of the mutant was not promising.

2665 Venkataraman, K.
Tenuous plants in *Sorghum Roxburghii*.
Madras. agric. J. 1959 : **46** : 12–16.
The occurrence of attenuated and very poorly developed plants, which failed to survive until the flowering stage, was due to a single recessive mutation (*tn*), as indicated by observations on the progeny of heterozygous plants.

2666 Wakankar, S. M. & Mahadik, C. N.
Two new jowars for Madhya Pradesh farmers.
Indian Fmg. 1959 : **8** : No. 11 : p. 17.
The grain-sorghum varieties Gwalior 82 and Gwalior 304 have been released for northern Madhya Pradesh. Gwalior 82 takes 110 days after sowing to reach maturity and has yellow grains, semicompact panicles and an average yield of 750–900 lb. per acre. Gwalior 304, with chalky-white grains and lax panicles, ripens after 120 days and gives an average yield of 750–900 lb. per acre. Both varieties have a 1000-grain weight of 34·0 g.

2667 Maunder, A. B. & Pickett, R. C.
The genetic inheritance of cytoplasmic-genetic male sterility in grain sorghum.
Agron. J. 1959 : **51** : 47–49.
In studies conducted at Purdue University,

Ind., the male-sterile line Combine Kafir 60 and three male-sterile derivatives of the latter were crossed with 23 fertile varieties and hybrids. Fertile F_1 hybrids resulting from these crosses were back crossed to male-sterile, Combine Kafir 60; such test crosses gave 1 : 1 ratios of fertile to male-sterile plants. Selfing the F_1 hybrids and fertile test crosses produced 3 : 1 ratios of fertile to sterile plants. It is concluded that male sterility depends on a single recessive gene designated ms_c interacting with sterile cytoplasm. Unlike ms_2, another gene for male sterility, ms_c is not linked with the gene responsible for the awned character. Microsporogenesis in male-sterile Combine Kafir 60 appeared to be normal but the pollen grains tended to shrivel before anther dehiscence. [Cf. 201].

2668 Stanton, W. R., Miller, T. B. & Curtis, D. L.
A chemical basis for the classification of glume colour in Nigerian cultivated sorghums.
Nature, Lond. 1959 : **183** : 807–08.

The results of a preliminary paper-chromatographic analysis of sorghum types in Nigeria are reported. It is not however possible at the present stage to correlate the results with the quantitative effects of gene action.

2669 Stewart, R. B. & Reyes, L.
Head smut of sorghum and varietal reaction.
Plant Dis. Reptr. 1958 : **42** : 1133–40.

Detailed field tests have been carried out on a large number of sorghum varieties to determine their resistance to head smut, *Sorosporium reilianum*. The most resistant of the popular varieties are DDY milo and Caprock; the feterita group, represented by Spur feterita in the present test, also showed immunity, together with Manchu Br. kaoliang, and the Hegari types. Speculations concerning the mechanism for inheritance of resistance are made. In some cases this is a simple dominant character, in others it is more probably not qualitative.
There is evidence of the existence of more than one physiological race of head smut in sorghum.

2670 Sanders, M. E., Franzke, C. J. & Ross, J. G.
Influence of environmental factors on origin of colchicine-induced true-breeding diploid mutants in sorghum.
Amer. J. Bot. 1959 : **46** : 119–25.

With improved conditions of growth for colchicine-treated seedlings in aseptic cultures, no true-breeding diploid mutants were obtained from the sorghum Experimental 3, although in previous treatments this line has given rise to a high percentage of such mutants [cf. XXVIII, 510 and 2990]. In addition, provision of such conditions decreased the colchicine effects of retarded seedling growth and reduced survival. Improved conditions may so stimulate the original tissues of the seedlings that they are seldom supplanted by new tissues developing from cells changed by colchicine.

RICE

2671 Buffa, G.
Prove comparative e saggi di rendimento fra diverse razze di riso. (**Comparative tests and yield trials of various rice cultivars**).
Riso, Milano 1959 : **8** : No. 2 : 6–10.

In tests carried out in the Italian provinces of Novara and Vercelli in 1958, only Balilla a grana grossa [Large-grained Balilla] exceeded Americano 1600 in yield [cf. XXV, 2032].

2672 **Report of the Sixth Session of the International Rice Commission, held at Tokyo, Japan on 3-4 October, 1958.**
FAO UN, Rome 1958 : Mtg. Rep. No. 1958/20 : Pp. 45. (Mimeographed).

The report includes a summary of the discussions on the achievements of the commission to date and on work to be undertaken in the future. The activities of the Working Party on Rice Breeding are among those broadly reviewed The international project of hybridization between *japonica* and *indica* varieties was concluded in 1956, participating countries having made effective use of the material. The maintenance of collections of genetic stocks in India, Indonesia, Japan, Pakistan and the USA is expected to provide permanent sources of germ plasm. In contradiction to the long-held view that greater response to fertilizers is a character typical of the *japonica* group, recent field experiments have shown that a greater response to fertilizer is also found in some *indica* varieties, especially in those high in yielding capacity. Preliminary tests in India and the Philippines have indicated that blast-resistant *indica* types suitable for breeding are available. Although rapid progress has been achieved in most participating countries, an excessively large number of varieties, improved and indigenous, are still in cultivation. Varieties and selections should therefore be tested under a wide range of conditions to eliminate types low in yield, greater attention being given to photoperiodic

reaction in order to obtain varieties with the maximum adaptability to varying day lengths. In addition to the study of fertilizer reaction and the related problem of lodging resistance, in anticipation of the improvement of rice cultivation, such aspects as earliness, disease resistance, tolerance of salinity and the physiological behaviour of the rice plant other than photoperiodic reaction require consideration.

2673 Cada, E., Nepomuceno, J. & Valencia, L. C.
Performance of introduced rice varieties from Indonesia.
Philipp. J. Agric. 1955 : **20** : 175–207.

Eighteen varieties from Indonesia were compared for tillering capacity, height, flowering and maturation periods, lodging, disease resistance, yield, and milling and culinary qualities in the Philippines. On the basis of this comparison, Peta, Brondol Putih T–43, Intan and Tjahaja are recommended for general planting, at least in central Luzon.

2674 Situation des travaux d'amélioration du riz à Richard-Toll en 1958. (**The state of the work of rice improvement at Richard-Toll in 1958**).
Riz et Rizic. 1958 : **4** : 175–81.

Accounts are provided of plans proposed by Magne in 1955 for studying and improving rice varieties at the Richard-Toll station in Senegal. Mention is made of some introduced varieties which have given promising results; also some hybrids with desirable combinations of characters have been produced.

2675 Nagao, S., Takahashi, M. & Kinoshita, T.
(**Genetical studies on rice plants. XXIII. On the genetics of the type of inflorescence borne by the rice variety Furenbozu**).
Hokkaido Daigaku Nogakugu Hobun Kiyo/Mem. Fac. Agric. Hokkaido Univ. 1958 : **3** : 38–46. [Japanese].

The above variety has undulate and profusely branching rachides. Crosses with three other varieties showed that its type of inflorescence was determined by an incompletely dominant gene, designated *Ur*, which is linked with *fs* (fine-striped seedling) with a cross-over value of *ca.* 27%. The inheritance of quantitative characters of the panicle was studied in the three crosses cited. *Ur* appears to act pleiotropically on inflorescence characteristics. Heritabilities were estimated for various plant characters. Except for plant height (heritability 54·3–67·6%), heritabilities were rather low; moreover they frequently differed considerably according to the cross. Heterosis for panicle weight and spikelet number was noted in the cross Akamuro x Furenbozu.

2676 Aziz, M. A. & Shafi, M.
The inheritance of colour in lemma and palea and kernel of rice.
Pakist. J. sci. Res. 1958 : **10** : 136–43.

Data from crosses of the Kashmir variety Babir with the local varieties 100 Ramjiwain, 41 Lalnakanda and 72 Phulpattas at the Rice Farm, Kala Shah Kaku, West Pakistan, indicated that straw-yellow colour of the lemma and palea depended upon the interaction of two complementary genes, L_1 and L_2, which prevented the production of anthocyanin. When either of the two genes was present, the lemma and palea were golden, these plant parts being reddish brown when neither of the genes was present. L_1 and L_2 are inherited independently of genes for purple coloration of the leaf sheath, leaf blade, stigma, apiculus and outer glume. Red colour of the kernel was dominant to white and dependent upon a single gene, *Pr*, inherited independently of other genes for anthocyanin pigmentation [cf. XXVIII, 4239].

2677 Hsieh, S.-C. & Oka, H.-I.
Cytological studies of sterility in hybrids between distantly related varieties of rice, *Oryza sativa*, K.
Idengaku Zasshi/Jap. J. Genet. 1958 : **33** : 73–80.

F_1 plants and their parental strains were regular in chromosome pairing and did not differ significantly as regards frequency of the rarely occurring univalents, of "stretched" chromosomes at metaphase I and of bridges at anaphase I. Stretched chromosomes may be due to precocious separation of bivalents. The occurrence of such chromosomes and univalents may be indicative of loose pairing of homologues, possibly as the result of the formation of an insufficient number of chiasmata per chromosome. Correlation data suggested that the tendency to form bridges may be determined by the genotype. Bridge frequency showed no significant relationship with seed or pollen fertility in the F_1 hybrids. The nature of the bridges is unknown, but they cannot be inversion bridges in view of their presence in the parental pure lines. The investigations therefore provided no support of the hypothesis that the sterility of hybrids between distantly related varieties of rice is attributable to inversion heterozygosity.

2678 Piacco, R.
Il miglioramento del riso nei principali paesi risicoli con particolare riguardo ai metodi d'incrocio impiegati. (**The improvement of rice in the principal producing countries and the methods of hybridization used**).
Sementi elette 1958 : **4** : No. 6 : 18–29.
An historical outline is given of hybridization work with rice in Italy; details are given of the techniques employed and comparisons made with methods used in certain other countries. The plants to be pollinated are now grown mostly in pots and pollinated indoors; emasculation by hot air at 46° C. and hand pollination with entire anthers are among the methods preferred.

2679 Favero, A.
La varietà di riso Trionfo Fassone. (**The rice variety Trionfo Fassone**).
Sementi elette 1958 : **4** : No. 6 : 63–64.
A further description is given of this promising variety.

2680 Souma, Y.
(**On Mutsuhikari rice**).
Aomori Ken Noji Shikenjo Kenkyu Hokoku/Bull. Aomori agric. Exp. Sta. 1955 : No. 2 : 39–48. [Japanese].
A description is given of the above variety and of its performance in local trials. It is a high-yielding, midlate variety with some resistance to low temperature. It is a selection from the cross Tohoku 42 [North-eastern 42] x Tono 3.

2681 Korah, M.
Two rare chromosomal abnormalities in *Oryza sativa* L. induced by X-rays.
Phyton, Vicente López 1958 : **11** : 97–101.
The occurrence of ring-shaped metaphase chromosomes was noted in a few cells from root tips of seedlings raised from X-irradiated seeds. This condition arose through failure of the chromatids to separate at one or both ends, and is explained on the basis of disturbance in the normal cycle of separation of four regions within a chromosome as postulated by Lima-de-Faria [XXVI, 3012]. In sequence of division and separation these regions are (1) the median portion of each arm, (2) the ends, (3) the centromere and (4) the proximal regions of the arms. The other abnormality was the very rare occurrence of an interlocked bridge in the equatorial region. This phenomenon may be explained as follows. Two chromosomes were broken at the same loci in the proximal portions. Translocation then occurred, the centric portion of one chromosome fusing with the centric portion of the other and the acentric portions also fusing, so that one dicentric and an acentric were present at metaphase. At anaphase, each of the two sister dicentric chromatids were pulled towards the nearer pole by both its centromeres. Subsequently, as the result of a full turn of the chromatids about one another, the U-shaped daughter chromosomes formed an interlocked bridge. Other possible explanations of both abnormalities are however briefly suggested.

2682 Takahashi, N.
(**On intervarietal differences in the velocity of germination of rice grains**).
Nogaku Kenkyusho Iho/Bull. Inst. agric. Res. Tohoku Univ. 1955 : **7** : 1–12. [Japanese].
The relative velocities of germination of the three varieties studied were: Ou 195 > Rikuu 132>Ou 200. Speed of germination was positively correlated with rate of oxygen uptake.

2683 Butany, W. T. & Nair, N. R.
The occurrence of poly-husked spikelets and other abnormalities in rice panicles.
Curr. Sci. 1959 : **28** : 79–80.
One of the plants from W 703 x Ac 1780 was polyhusked and another was poorly developed and showed striping extending from the leaf sheath to all other parts of the plant. When Ac 1780 was crossed with Ac 1765, some of the progeny had adventitious roots on the panicle. This character was found to be simple recessive to the normal condition.

2684 Halick, J. V. & Kelly, V. J.
Gelatinization and pasting characteristics of rice varieties as related to cooking behavior.
Cereal Chem. 1959 : **36** : 91–98.
Eighteen varieties were analysed with respect to their starch-iodine values, which are inversely related to amylose content, and their gelatinization and pasting characteristics. Water uptake of whole kernels at three temperatures was also determined. In general, the amylograph curves of varieties with short and medium grain were characterized by lower gelatinization temperatures and shorter gelatinization times than those of long-grained varieties. Century Patna 231 (long-grained) and Early Prolific (medium-grained) were atypical in having very high gelatinization temperatures, respectively 79·5° and 75·5° C. The long-grained variety Toro was also exceptional, with a gelatinization

temperature (68·5° C.) within the range of types with short and medium grain. While gelatinization temperatures were independent of amylose content, the maximum viscosity of the hot paste and gel formation on cooling were related to amylose content. In all varieties, water uptake by whole rice at 72°–82° C. was closely related to gelatinization characteristics. Varieties with short and medium grain, having gelatinization temperatures of 64·5–67·5° C., absorbed more water than long-grained. Toro was similar to the short- and medium-grained types in water uptake. Early Prolific and Century Patna 231 absorbed less water than any of the other varieties.

2685 Govindaswami, S. & Krishnamurthy, A.
A note on the occurrence of a new species of *Oryza* in Jeypore tract.
Sci. & Cult. 1958 : **24** : 234–36.

A species tentatively designated *O. jeyporensis* ($2n = 24$) has been found in the Jeypore tract, Orissa. Its characteristic features include very broad leaves, short ligule, lax panicle, long sterile lemma and long awns. In gross morphological appearance it shows most resemblance to *O. glaberrima* but differs markedly from this species in several respects. The new species is being crossed with *O. glaberrima* and other species to study its genetics and relationships.

2686 Krishnaswamy, N. & Chandrasekharan, P.
A new species of *Oryza*, L.
Madras agric. J. 1958 : **45** : 471–72.

A description is given of *O. malampuzhaensis* ($2n = 48$), collected in the Emurbhagavati Hills, Kerala, and Anamalai Hills, Madras. [cf. XXVIII, 4249].

2687 Favero, A.
Oltre 131 quintali di risone per ettaro! **(Over 131 quintals of rice per hectare).**
G. Agric. 1958 : **68** : p. 435.

With a yield of 131·19 c. per ha. the variety Balilla a grana grossa [Large-grained Balilla] has beaten all previous records for grain yield by this or any other rice cultivar. The characteristics of the variety are outlined. [Cf. XXV, 2032.] It has short straw very resistant to lodging, compact, awnless panicles free from shedding, high resistance to foot rot (*Fusarium* spp.), and medium resistance to blast (*Helminthosporium* spp. and *Piricularia* sp.) and basal stalk rot (*Sclerotium* sp.). The hulled caryopses have the following dimensions: length 6·3 mm., breadth 3·2 mm., thickness 2·3 mm., the ratio of length : breadth being 1·97.

2688 De Beni, U.
Oltre 131 quintali di risone per ettaro. **(Over 131 quintals of rice per hectare).**
Riso, Milano 1959 : **8** : 10–11.

Reference is made to an article by A. Favero under the above title [cf. 2687]. It is pointed out that the variety Balilla a grana grossa [Large-grained Balilla] has been improved by further selection and is now more disease resistant and earlier, maturing no later than Balilla. It regularly yields 115–120 c. of grain per ha. or more, when grown under good conditions in the Bologna area.

2689 Pan, C. L.
Varietal difference in response to fertilizer in rice.
Z. Pflanzenz. 1958 : **40** : 341–45.

A large number of rice varieties were tested in a replicated yield trial using five rates of nitrogen fertilization in Sakha, Egypt. Two groups of varieties were found giving different modes of response to the treatment. A simple analysis of variance was made for the yield data of nine varieties from each group. One group showed a linear regression, giving an average response of 13·3 kg. of paddy grain per ha. for every kg. of nitrogen applied at all levels. In the other group, the response was curvilinear, being greatest at the lower levels of fertilization. The best results were obtained with the first group.

2690 Morita, N. & Taya, N.
(Studies on the dynamics of the straw of rice varieties in connexion with lodging. I. The dynamic properties of rice straw as influenced by different quantities of stable manure or nitrogenous fertilizers and their connexion with lodging. II. Dynamic properties at different periods, bending at maturity and their influence on lodging).
Hirosaki Daigaku Nogakubu Gakujutsu Hokoku/Bull. Fac. Agric. Hirosaki Univ. 1957 : No. 3 : 52–66. [Japanese].

In the first paper, buckling load P is taken as equal to $\frac{\pi^2}{4}\frac{EI}{l^2}$, where E is Young's modulus for the third internode of the culm, I is the moment of inertia and l is culm length. In the second paper, it is reported that E is a varietal characteristic; E and I are inversely correlated. Bending strength, σ, of the culm also varies according to variety.

2691 Baba, I.
(Studies on the physiology of vegetative growth in connexion with the mechanism of occurrence of *Cochliobolus miyabeanus* and autumn decline in rice).
Nogyo Gijutsu Kenkyusho Hokoku/Bull. Nat. Inst. agric. Sci. : Ser. D : 1958 : No. 7 : 1–157. [Japanese].

Among Japanese varieties, resistance to the above diseases and to the toxic action of H_2S on the roots is parallel, especially at higher temperatures. It seems that susceptibility to the two diseases arises when nutrients such as N, K, Si, Mg and Mn become depleted in the soil water. The effects of depletion become much aggravated when H_2S is present in the soil water since this causes selective inhibition of nutrient uptake, in particular of K, Si and Mn. The resistance of Indian varieties to *C. miyabeanus* appears to be of a different nature. Among Japanese varieties, resistance to the two diseases appears to be associated with a somewhat higher Eh.

2692 Sato, K., Sakamoto, M., Kudo, S. & Omatsuzawa, T.
(Studies on *Cochliobolus miyabeanus*. II. Histological observations on the epidermal tissue of the inner side of the leaf sheath after infection by the fungal pathogen).
Nogaku Kenkyusho Iho/Bull. Inst. agric. Res. Tohoku Univ. 1958 : **9** : 227–52. [Japanese].

A detailed comparative histological study of the reaction of the epidermal cells to infection by the above pathogen in eleven varieties is reported. The experiments were repeated using *Piricularia oryzae*. The varieties could be classified into four groups: a, highly susceptible to both fungi; b, only slightly susceptible to both fungi; c, highly susceptible to *Piricularia* but resistant to *Cochliobolus*; and d, the converse of c. The only variety in the doubly resistant category b was Ishikarishirake.

2693 Nonaka, F. & Yoshii, H.
(Relation between maturation period and degree of injury caused by *Leptosphaeria salvinii* in rice. I. Seasonal observations on the degree of injury caused by *L. salvinii* and on penetration of the culm).
Nogaku Kenkyusho Iho/Bull. Inst. agric. Res. Tohoku Univ. 1955 : **7** : No. 1 : 439–45. [Japanese].

A comparative study involving two early and two late varieties showed that the former are penetrated more rapidly by the fungus, when compared at the same growth stage as the latter, and suffer greater injury.

2694 Simon, J.
A magyarországi rizsbetegségek nemesítési vonatkozásai. **(Rice diseases in Hungary as related to the questions of breeding).**
Magyar tud. Akad. Agrártud. Oszt. Közl. 1958 : **14** : 226–34.

In breeding for resistance to blast in the widely grown susceptible Hungarian variety Dunghan Shali [cf. XXVIII, 4268], back crosses involving the resistant varieties Uz-Rosz 72, Uz-Rosz 17, line 45, Agostano, Precoce Allorio [Allorio Early] and Santahezskij 52 have been made. The last-mentioned variety proved a particularly useful parent.

2695 Džulaj, A. P.
(Rice growing in China is progressing).
Zemledelie (Agriculture) 1958 : No. 5 : 85–90. [Russian].

The high-yielding varieties 412 and 514 from the province of Kiangsu are mentioned for resistance to *Piricularia*.

2696 Wang, M.-K. & Yang, S.-C.
(Differences in capacity to resist blast among Peng-lai rices in Taiwan and their effect upon yield).
Chung-hua Nung-hsueh Hui Pao/J. agric. Ass. China 1956 : **14** : 38–41. [Chinese].

A test of varieties of the Peng-lai (= Horai) type subjected to heavy natural blast infection at the Chiayi research station is reported. The highest yielding variety under these conditions was Chia-nung-yoh 242 (Chiayi Agricultural Research Station 242]. The most disease-resistant varieties were Kuang-fu 1, Chia-nung-yoh 242 and Chia-nung-yoh 280. [Cf. XXVIII, 3004.]

2697 Oka, H.-I.
Photoperiodic adaptation to latitude in rice varieties.
Phyton, Vicente López 1958 : **11** : 153–60.

Pure lines of 163 varieties from different parts of Asia were sown in the field at monthly intervals at the Taiwan Provincial Agricultural College, Taichung, where the day length (including twilight) varies from 14 hr. 40 min. to 11 hr. 30 min. and the temperatures are such that rice may be grown all the year round. A line representing the change in the duration of the growth period (from sowing to heading) in response to photoperiod, possibly associated

with initiation of the floral primordia 30 days before heading, was drawn in order to evaluate sensitivity. In the case of each variety, the angle between the line and abscissa varies according to day length, reaching a maximum at a certain day length. The maximum angle served as the measurement of sensitivity, while the corresponding day length was regarded as the critical one. Varieties from northern temperate and equatorial regions were usually insensitive. Varieties from countries between these two main areas were either sensitive or insensitive. The lower the latitude of the area of origin the higher the degree of sensitivity and the shorter the critical photoperiod. In the case of the insensitive varieties, the lower the latitude the longer the growing period. Such latitudinal clines may be explained on the basis of adaptation and human selection.

MINOR CEREALS

2698 Tucker, J. M. & Sauer, J. D.
Aberrant *Amaranthus* populations of the Sacramento - San Joaquin Delta, California.
Madroño, S. Francisco 1958 : **14** : 252–61.

A highly variable population comprising hybrids involving the five species *A. caudatus*, *A. cruentus*, *A. hybridus*, *A. powelii* and *A. retroflexus* occurs in the weed flora of the rich soils of the above region. No individual plant, however, appeared to be derived from more than three different species. With the exception of *A. powelii*, it is unlikely that any of the species were present in this area before 1850. The hybrids are more vigorous than the ancestral species but do not extend to nearby soils of lesser fertility.

2699 Raéz, J. L., Arroyo Vergara, J. R. & Mantari Camargo, C.
Experimentos comparativos de variedades de cañihua de Puno y Junín. (**Comparative trials of varieties of *Chenopodium pallidicaule* from Puno and Junín**).
Inform. Div. Exp. agríc., Lima 1958 : No. 61 : Pp. 9.

In the department of Puno, Peru, Blanca de Puno [Puno White] and Rosada de Puno [Puno Pink] were the most productive of four varieties tested while in Junín, Blanca de Puno and Morada de Puno [Puno Purple] were best. Blanca de Orurillo [Orurillo White], tested for one season only, showed promise for Puno. Blanca de Puno and Rosada de Puno were also best in seed yield and hectolitre weight.

FORAGE GRASSES

2700 Caputa, J.
Die Züchtung von Wiesenfutterpflanzen. Einige Beobachtungen aus der Pflanzenzuchtstation Aberystwyth (Wales), Grossbritannien. [**The breeding of meadow forage plants. Some observations on the Plant Breeding Station, Aberystwyth (Wales), Great Britain**].
Schweiz. landw. Mh. 1958 : **36** : 356–62.

The work of the above station is briefly described, the breeding methods in use being also mentioned.

2701 Relazione sull'attività della Stazione Sperimentale di Praticoltura di Lodi negli anni 1955–1956. (**Report on the activities of the Forage Experimental Station at Lodi for 1955 and 1956**).
1958 : Pp. 130.

Observations have been made on a wide range of grasses and legumes not previously cultivated in Italy and tabular data are given on their behaviour and yield of forage and of seed.

Maize. In tests of maize for fodder, sown after wheat, strong-growing hybrids such as Indiana 750A, Maygold 49 and Wisconsin 641AA have proved the most promising.

Legumes. Tests of *Trifolium repens* of different provenance have shown the superiority of Ladino clover both in northern Italy and in Switzerland; the best were those from Lombardy and Piedmont, the USA and New Zealand, the last-named being however dwarf types, not tall. Provenance tests of lucerne showed that from Bologna to be better than those from other parts of Italy in the early cuts but the station's line 202 was best in the fourth cut and in later years.

Introductions of *Vigna sinensis* 'Iron Clay' from the USA proved superior to local cultivars in yielding ability and were healthy and less prone to flowering.

2702 Horošajlov, N. G.
(**The breeding of forage plants in the USSR**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 5 : 14–19. [Russian].

The efficacy of different breeding methods with grasses and leguminous forage plants is discussed and tabulated information is given to show that the highest proportion of Soviet standard varieties, 48·65%, was obtained by means of selection of local populations and that local varieties have provided initial material for the greatest number of recent standard varieties.

But it is emphasized that other methods and breeding material have also been useful. For instance, the lucerne Zajkevič, the sainfoin Pesčanyj 1251 and the spring vetch L'gov 31292 are not selections of local populations; in various regions of the USSR wild forms of red clover have provided the best initial breeding material.

2703 Bogdan, A. V.
The selection of tropical ley grasses in Kenya : general considerations and methods.
E. Afr. agric. J. 1959 : **24** : 206–17.

An account is given of the problems involved in selection and strain building of grasses in Kenya and of some of the results already obtained, chiefly with reference to *Setaria sphacelata, Chloris gayana, Cynodon dactylon, C. plectostachyus, Panicum maximum, Melinis minutiflora, Cenchrus ciliaris, Brachiaria brizantha, B. ruziziensis* and *Bothriochloa insculpta.* The importance of information on breeding behaviour is stressed. Bagging and progeny tests at the Kitale Grassland Research Station have provided evidence that (1) *S. sphacelata* and *Ch. gayana* are predominantly cross-fertilized, (2) *M. minutifolia* and the above two species of *Brachiaria* are self fertile and possibly apomictic, and (3) *C. ciliaris* is an obligatory apomict.

2704 Bradshaw, A. D. & Snaydon, R. W.
Population differentiation within plant species in response to soil factors.
Nature, Lond. 1959 : **183** : 129–30.

Populations of *Festuca ovina* and *Agrostis tenuis* from localities with different soils in England and Wales were tested for their growth response to contrasting natural soils under greenhouse conditions and to a range of Ca concentrations in sand culture. The results provided evidence of the occurrence of edaphic ecotypes within the former species but not within the latter. The reactions of *Trifolium repens* populations to Ca and P in sand culture have also revealed the occurrence of edaphic ecotypes.

2705 Tateoka, T.
Chromosomes of five Indian and Ceylonese grass species.
Curr. Sci. 1959 : **28** : 78–79.

In *Arundinella*, two basic chromosome numbers occur, 7 and 10. *A. villosa* was observed to have $2n = 14$ and *A. blephariphylla* $2n = 20$. *Garnotia scoparia* has a basic chromosome unmber of 10, showing $2n = 20$, with similar chromosome morphology to *Arundinella*. The chromosome number of *Perotis patens* is $2n = 40$ and of *Spinifex littoreus*, a diecious plant, $2n = 18$.

2706 de Wet, J. M. J.
Additional chromosome numbers in Transvaal grasses.
Cytologia, Tokyo 1958 : **23** : 113–18.

Counts of $2n$ numbers were made in 47 species and varieties representing 25 genera of the Gramineae. Chromosome numbers are reported for the first time in the case of 18 species and varieties, including the following: *Agrostis barbuligera, A. lachnantha*, 28; *Andropogon filifolius*, 60; *Arundinella nepalensis*, 54; *Digitaria ternata*, 30; *Eragrostis heteromera*, 40; *Fingerhuthia africana*, 40; *F. sesleriaeformis*, 20; *Festuca costata*, 28; *Harpechloa falx*, 40; *Hyarrhenia gazensis*, 30; *H. rufa*, 40; *Panicum ecklonii*, 54; *P. natalensis*, 18; *Sporobolus fimbriatus* var. *latifolius*, 36; and *Trichopteryx dregeana*, 24. On cytological and anatomical grounds, it is suggested that *Aristida* should be removed from the Eragrostoideae and *Fingerhuthia* from the Festucoideae.

2707 Gould, F. W.
Chromosome numbers in southwestern grasses.
Amer. J. Bot. 1958 : **45** : 757–67.

One hundred and seventeen chromosome counts are reported for collections representing 82 species and varieties of grasses occurring in Texas and adjacent areas. Twenty-one of the counts differ from those previously reported. Among the n numbers reported for the first time are the following: *Stipa avenacea*, 11; *Festuca octoflora* var. *glauca*, 7; *Poa autumnalis*, 14; *Eragrostis pectinacea*, 20 and 30; *E. lugens*, 20, 40, *ca.* 54; *E. capillaris, E. hirsuta*, 50; *Chloris ciliata, Ch. petraea*, 20; *Ch. polydactyla*, 36; *Ch. latisquamea, ca.* 32, *ca.* 36, *ca.* 42; *Sporobolus giganteus*, 18; *Muehlenbergia schreberi, M. rigida*, 20; *Panicum joori, P. laxiflorum, P. oligosanthes* var. *helleri, P. pedicillatum, P. hallii*, 9; *P. reverchoni*, 18, 36; *P. fasciculatum* var. *reticulatum*, 9, 18; *Paspalum lividum, P. minus*, 20; *P. hartwegianum*, 30; *Cenchrus incertus*, 16, 17; *C. longispinus*, 17; *Pennisetum ciliare*, 18; *Echinochloa crus-galli* vars. *macera* and *microstachya*, 18; and *Andropogon palmeri*, 90.

2708 Birch, W. R.
Observations on the flowering of exotic pasture grasses in Kenya.
E. Afr. agric. J. 1958 : **24** : 142–47.

Records of dates of flower emergence and of numbers of panicles exserted were made for

strains of cocksfoot, perennial ryegrass, timothy and smooth brome at the Molo Grassland Research Station (altitude 9000 ft., latitude 0° 25′ S.) in Kenya. A great range in times of flower emergence and panicle numbers was found between bred strains of cocksfoot and to a lesser extent between bred strains of ryegrass, timothy and smooth brome. The interval from sowing to flower emergence ranged from 119 to 194 days among the bred cocksfoots and from 151 to 222 days among the bred strains of ryegrass. Cocksfoot ecotypes from the Mediterranean region flowered between 119 and 149 days from sowing, while the range among the ryegrass ecotypes, also from the Mediterranean region, was from 98 to 171 days from sowing. Bred, leafy strains of cocksfoot from high latitudes produced very few panicles compared with commercial strains or ecotypes. With the exception of the Cluny strain from Australia, the bred ryegrasses produced very few panicles, but many of the ecotypes flowered fairly well. Only one strain of timothy flowered well. Smooth-brome strains produced few or no flowers. The observations indicate that selection for leafiness in high latitudes has in general resulted in strains which are more sensitive to day-length and temperature than commercial or naturally occurring ecotypes from the Mediterranean region. The results further indicated that suitable material for local selection and breeding is available, but whether, apart from the problems of rust resistance and seed shattering, such work should be initiated with locally flowering strains, which are often relatively stemmy, or with shy seeders which are more leafy, is a matter of debate.

2709 Nielsen, E. L. & Dickson, J. G.
Evaluation of timothy clones for stem rust reaction.
Agron. J. 1958 : **50** : 749–52.

A full account is given of investigations which have already been briefly reported [205].

2710 Burger, O. J. & Glover, F. W. (Jun.)
Smooth brome grass varieties for West Virginia.
Bull. W. Va. agric. Exp. Sta. 1958 : No. 415 : Pp. 14.

Information is provided on the performance of 11 varieties sown at five centres in West Virginia in the spring and summer of 1951. Southern varieties gave consistently higher yields than intermediate or northern varieties. Southern varieties producing the highest yields of dry matter per acre were Achenbach, Elsberry, Fischer, Lincoln, Oklahoma 1 and Southland.

2711 Knowles, R. P.
Performance of synthetic varieties of grasses.
Forage Notes, Ottawa 1958 : **4** : No. 1 : 7–9.

Progress in the development of synthetics of brome grass and crested wheat grass at the Forage Crops Laboratory, Saskatoon, Sask., is assessed. Synthetics of brome grass have been produced with three objectives: (1) a northern type with good seed and forage yields, (2) a synthetic derived chiefly from selections of the southern type, and (3) a substitute for Parkland with good seed production. S–4088 and S–4092 respectively represent the outcome of work on (1) and (2) while S–4506 and S–4475 have been developed in project (3). The performance of these synthetics is considered to be promising. Although derived from four plants in all cases, no noticeable decline in forage yield from the Syn.1 to Syn.2 has occurred. Some decrease in seed yield may have taken place between these two generations in S–4088 and S–4506. Reselection is however desirable in all the synthetics prior to their possible release. Production of synthetics of crested wheat grass has met with much less success. In general, only when tested as spaced plants have the synthetics given a better performance than the controls [cf. XXVIII, 1326]. Following the procedure employed for brome grass, use is now being made of a replicated clonal nursery, instead of single plants, to provide open-pollinated seed for progeny testing of selections, the progenies being studied in multiple-row plots with a 1 ft. row spacing instead of in single rows spaced 2 ft. apart. Although forage yields of synthetics have not exceeded those of Fairway, a response to selection for greater height has been secured and the release of a taller, erect strain of the Fairway type is under consideration.

2712 Nielson, A. K. & Kalton, R. R.
Combining ability for seed characteristics in *Bromus inermis* Leyss.
Agron. J. 1959 : **51** : 178–81.

Top-cross progenies of 18 S_0 clones and of 10 S_1 segregates from each of these clones, as well as top-cross progenies of 13 other S_0 clones, were evaluated for seed yield (lb./acre), panicle number (per 4 ft.^{2}) and a fertility index derived from $\frac{\text{weight of clean seed per 5 panicles}}{\text{weight of 5 unthreshed panicles}} \times 100$, during 1956 and 1957 in a replicated test without plant spacing at the Iowa Agricultural Experiment Station. Nine varieties and synthetics were used as controls. Since the same

variety (Fischer) constituted the top-cross parent in each case, the evaluations were considered to be estimates of general combining ability. In addition, 100-seed weight was determined in some top crosses. The wide range in all four characters among S_0 and S_1 top crosses and highly significant family mean squares in the over-all analyses of variance indicated considerable genetic variation in combining ability. In the S_1 top crosses, mean-square F values within families in both over-all analyses of variance and individual analyses were highly significant, ample evidence of segregation for combining ability thus being provided. Inbreeding had no apparent effect on combining ability for yield or weight but seemed to exert a deleterious effect on fertility index. A slight beneficial effect of inbreeding upon panicle number is attributed to chance on account of small sample size. Genetic correlations of 0·80 and 0·69 between yield and panicle number and of 0·73 and 0·41 between yield and fertility index were obtained from observations in 1956 and 1957 respectively. Panicle number and fertility index were therefore the primary components of yield. Raising the fertility index is probably more desirable in breeding for improved seed yield, since increasing panicle production may decrease forage value. Weight appeared to be independent of yield. Regression values for the relationships between S_0 and S_1 top-cross performance were 0·32, 0·38, 0·83 and 0·67 for seed yield, panicle number, fertility index and seed weight, respectively. Interannual correlations indicated that elimination of lines low in combining ability for seed characters could perhaps be accomplished on the basis of the results from a single year. Years x families interactions, however, pointed to the desirability of two or more years of testing. The results of a previous study of the parental clones [cf. XXVI, 3395], together with those of the present one, suggested that prediction of combining ability on the basis of the performance of the parental clones may be possible in the case of fertility index but not in that of panicle production. Using data obtained previously on forage yield [cf. XXVII, 598], a highly significant correlation was found between top-cross forage and seed yields.

2713 Nielsen, E. L., Dickson, J. G. & Smith, D. C.
Strain and seed treatment as factors in germination and seedling growth of smooth bromegrass.
Phytopathology 1959 : **49** : 8–12.

In these studies conducted at the Agricultural Experiment Station, Madison, Wis., strains from southern states exhibited slightly greater, although rather variable, tolerance of diseases than did northern strains. The occasional occurrence of vigorous and apparently healthy seedlings suggests that it may be possible to select types resistant to seedling diseases.

2714 Knowles, R. P.
Note on alteration of creeping habit of bromegrass by rejuvenation.
Canad. J. Pl. Sci. 1958 : **38** : 384–85.

The process of rejuvenation by ploughing on seed areas of bromegrass in Western Canada has the effect of increasing significantly the proportion of creeping types. Comparative data are given for Parkland from rejuvenated and unrejuvenated sources, registered Parkland and local commercial seed. Drastic tillage practices should therefore not be permitted in the propagation of new varieties.

2715 Nüesch, B.
Eigenschaften von Zuchtstämmen aus einheimischem Italienisch-Raigras. (**The characteristics of breeding lines from native Italian ryegrass**).
Mitt. schweiz. Landw. 1959 : **7** : 17–23.

Some lines tested at Zürich-Oerlikon have shown good winter hardiness, persistence and regenerating capacity; they are also very susceptible to *Puccinia coronata*. Nevertheless, on account of their superiority to foreign varieties, it is considered worth while to develop a new variety from the best of the native lines.

2716 MacVicar, R. M.
Note on Norlea perennial rye grass.
Canad. J. Pl. Sci. 1958 : **38** : p. 505.

Developed at the Forage Crops Division, Central Experimental Farm, Ottawa, the above variety possesses sufficient hardiness to survive and be productive in areas where, hitherto, the species has failed to overwinter satisfactorily. In 1940, a space-planted nursery of about 15,000 plants, representative of some 100 introductions from many parts of the world, was established. Repeated selection and progeny evaluation were carried out for six generations, emphasis being placed from the commencement on winter survival. At the stage of the fourth generation, the material carried forward consisted of the progeny of 12 clones. Selection for two more generations resulted in Norlea.

2717 **Gulf is new ryegrass released in Texas.**
Crops & Soils 1959 : **11** : No. 5 : 20–21.

In tests at the Rice-Pasture Experiment Station, Beaumont, Tex., a ryegrass introduced from

Uruguay and named Gulf has proved superior in leaf-rust resistance and winter and spring forage yields to varieties commonly in use. It may be used for grazing, hay or silage and, unlike other varieties, has produced volunteer seed each autumn.

2718 Bennett, H. W.
Artificial pollen germination for selection of improved seed production in *Paspalum dilatatum*, Poir.
Agron. J. 1959 : **51** : 109–11.

Combinations of various media, types and concentrations of sugars, pH values and temperatures were used for the artificial germination of pollen from clones of two selections of *P. dilatatum*, respectively high and low in seed-producing ability. The pollen was very short-lived, no germination being obtained with grains from anthers half an hour after dehiscence. Artificial germination of the pollen was found to be unreliable as a basis of selection for improved seed production.

2719 Bashaw, E. C. & Holt, E. C.
Megasporogenesis, embryo sac development and embryogenesis in Dallisgrass, *Paspalum dilatatum*, Poir.
Agron. J. 1958 : **50** : 753–56.

A detailed account is given of investigations which have already been briefly reported [171].

2720 Bennett, H. W.
The effect of soil moisture and light on flowering in *Paspalum* spp.
Agron. J. 1959 : **51** : 169–71.

In view of the prevention of hybridization between *P. dilatatum*, *P. urvellei* and *P. malacophyllum* by differences in time of flowering and pollination and by the impossibility of emasculation under natural conditions of flowering, investigations on the above were undertaken at the Mississippi Agricultural Experiment Station. The differences found between the three species in time and rate of flowering under ordinary summer conditions were not altered by day reversal and soil-moisture conditions. Order of flowering within the inflorescence was the same in all three species under normal conditions and was not affected by the above two factors.

2721 Baltensperger, A. A. & Kalton, R. R.
Variability in reed canarygrass, *Phalaris arundinacea* L. II. Seed shattering.
Agron. J. 1959 : **51** : 37–38.

In a field experiment conducted at Iowa Experiment Station, several panicles were harvested from each of 12 clones at five-day intervals beginning 15 days after flowering; the mean seed yield per panicle was determined for each clone at each harvest. The mean seed weights per panicle at 15 days after blooming varied considerably among the clones, indicating possible differences in the total seed yield per panicle or in fertility. Marked differences were also noted in respect of seed shattering; one selection retained most of its seed up to 40 days after flowering whilst others lost almost all their seed within 25 days. Thus the clones appear to show genetic differences in respect of seed shattering, these differences being independent of the date of flowering. [Cf. 1623.]

2722 Harlan, J. R., Celarier, R. P., Richardson, W. L., Brooks, M. H. & Mehra, K. L.
Studies on old world bluestems II.
Tech. Bull. Okla. agric. Exp. Sta. 1958 : No. T–72 : Pp. 23.

The group now receiving most attention at the Oklahoma State University comprises Old World species of *Bothriochloa*, *Dichanthium* and *Capillipedium*. Many accessions appear to be agronomically valuable; preliminary adaptation trials have therefore been initiated throughout the USA. Observations so far recorded suggest that some types of *B. caricosum*, *B. intermedia* and *B. pertusa* would find a place along the Gulf coasts of the south-east, while Mediterranean and Senegalese forms of *D. annulatum* would be valuable in the dry south-west and the more productive types of *B. ischaemum* in the southern Great Plains. Development of entirely new combinations of characters by special breeding techniques is however required for the full exploitation of the group; with this end in view cytological and other investigations have been carried out.

Determinations so far made of chromosome counts in *Bothriochloa* and *Dichanthium* are summarized, the same species complexes being referred to as in an earlier paper [cf. XXVI, 2445]. As reported previously, with the exception of *D. sericeum*, of which only diploids are known, the complexes are represented by tetraploids and, except for *D. caricosum*, also by hexaploids. Diploids in *D. annulatum* and pentaploids of *B. ischaemum* var. *ischaemum* have also been identified. Material previously assigned to *B. venusta* has now been provisionally included in the *B. intermedia* complex as the *gangetica* type.

Embryological studies have indicated that the mode of apomixis is pseudogamous apospory.

According to the results of a preliminary survey, the diploids are all sexual, the tetraploids mostly asexual but represented by some facultative types, and the pentaploids and hexaploids obligate apomicts. The sexual embryo-sacs typical of diploids and facultative apomicts have two conspicuous polar nuclei and a group of poorly staining antipodals. The asexual sacs characteristic of facultative and obligate apomicts have a single polar nucleus and no antipodals. Sexual sacs have been observed in all accessions examined but in the most strongly apomictic forms are crowded out by one to several sacs of the apomictic type.

The results from a large number of attempted hybridizations suggest that polyploidy is a consequence of the tendency to produce functional unreduced ♀ gametes, even in the sexual diploids. The most strongly apomictic types were accessions of *B. intermedia*, 4*x*, 5*x* and 6*x* *B. ischaemum* and 6*x* *D. papillosum*. Proven and presumptive hybrids so far obtained are as follows: Mediterranean type of *D. annulatum* (4*x*) x tropical type of *D. annulatum* (4*x*) and the reciprocal; Senegalese type of *D. annulatum* (4*x*) x tropical types of *D. annulatum* (4*x*); tropical type of *D. annulatum* (4*x*) x *gangetica* type of *B. intermedia* (4*x*); *D. caricosum* (4*x*) x *D. aristatum* (4*x*) and the reciprocal; *D. caricosum* x *D. annulatum* (4*x*); crosses of *B. intermedia* (*gangetica* type) with *B. intermedia* (6*x*), *B. ischaemum* (4*x*, 5*x*, 6*x*), *D. annulatum* (2*x*, 4*x*), *B. pertusa* (4*x*) and *C. parviflorum* (4*x*); *B. intermedia* (4*x*) x *B. intermedia* (*gangetica* type); and *B. intermedia* (4*x*) x *B. intermedia* (4*x*).

Analysis of morphological characters by means of scatter diagrams combined with measurements of the length of the axis of the inflorescence and length of the longest racemes indicated that *B. intermedia* holds a central position in the group, with gradation towards *C. parviflorum*, *B. ischaemum*, *B. pertusa* and, through the *gangetica* type, towards *D. annulatum*, the last-mentioned species showing marked affinity with *D. caricosum*. The differences between the taxons have not however been obliterated by introgressive hybridization, because such crossing as has occurred has primarily involved genome building and segregation has been blocked by apomixis. Since the three genera can be crossed artificially and have probably undergone natural hybridization, the validity of the present system of classification may be questioned, but it is pointed out that artificial hybridization has in many cases resulted in strongly apomictic and reproductively isolated forms and has not therefore caused genetic breakdown of the taxa involved.

Geographical data in combination with morphological observations have suggested the following. (1) Northern India is a centre of evolutionary activity in both the *D. annulatum* and *B. intermedia* complexes. The more sexual forms of the *gangetica* type of *B. intermedia* apparently cross with *D. annulatum* in the Gangetic Plain and with the broad-leaved *B. intermedia* types of the Himalayan foothills. Sexual tetraploids arising occasionally from fertilization of unreduced gametes of diploid *D. annulatum* probably contribute considerably to variability at the 4*x* level. (2) Oriental forms of *B. ischaemum*, found in the Chinese mainland, Taiwan, Hong Kong and Burma, are evidently the result of a genome-building process involving common *B. ischaemum* and some form of *B. intermedia*. (3) Genetic exchange between *B. pertusa* and *B. intermedia* is probably most active in east Africa. (4) Other members of the *B. intermedia* complex are playing an evolutionary role in Australia, a fairly well-defined step-by-step morphological gradation from *C. parviflorum* to *B. intermedia* and *B. ewartiana* being found. (5) In W. Pakistan, genome exchange appears to be occurring between *B. intermedia* and common *B. ischaemum*. The Mediterranean type of *D. annulatum* may involve genetic material from *B. ischaemum*.

Finally, a diagram is given showing a phylogenetic scheme suggested for some of the Old World bluestems.

2723 Richardson, W. L.
A technique of emasculating small grass florets.
Indian J. Genet. 1958 : **18** : 69–73.

Details are given of the technique of emasculation and pollination which has been successfully applied to *Bothriochloa* and *Dichanthium* at the Oklahoma Agricultural Experiment Station.

2724 Mukherjee, S. K.
Revision of the genus *Erianthus* Michx. (Gramineae).
Lloydia 1958 : **21** : 157–88.

A survey of the history, range of characteristics and distribution of the genus is followed by full descriptions of the 28 species recognized and a key for their identification.

2725 Emery, W. H. P. & Brown, W. V.
Apomixis in the Gramineae. Tribe Andropogoneae: *Heteropogon contortus*.
Madroño, S. Francisco 1958 : **14** : 238–46.

The above species is widespread and believed to

be indigenous in the tropics of Asia, Africa, America, Australia, and numerous Pacific islands. Diploid plants ($2n = 20$) have been reported from India but the material collected for the present investigation, from Australia, Java, India, Africa, Madagascar, Mexico and Texas, was either tetraploid or hexaploid, and apomictic; one or more 4-nucleate aposporous embryo sacs are regularly formed. In view of the wide distribution of this apomict, it is pointed out that we may have here a case of apomictic reproduction persisting from Eocene times or even earlier.

2726 Hirayoshi, I., Nishikawa, K., Kubono, M. & Murase, T.
Cytogenetical studies on forage plants. VI. On the chromosome number of *Miscanthus sacchariflorus*).
Gifu Daigaku Nogakubu Kenkyu Hokoku/Res. Bull. Fac. Agric. Gifu Univ. 1957 : No. 8 : 8–13. [Japanese].
Samples from 45 localities throughout Japan all had $2n = 76$. Two hybrids of *M. sinensis* x *M. sacchariflorus* with $2n = 57$ were also found. [Cf. XXVII, 3061.]

2727 Smith, T. J., Gish, P. T. & Williams, A. S.
Varietal tests of Sudangrass and pearl millet conducted in Virginia, 1954-57).
Res. Rep. Va. agric. Exp. Sta. 1958 : No. 16 : Pp. 19.
Of the released varieties of Sudan grass, Piper was considered to be unequalled in over-all desirability. The experimental entries Stoneville Selection and Stoneville Synthetic 1 were promising on account of their disease resistance. Both were derived from Sudan grass x sorgo, the synthetic being an increase of mixed open-pollinated seed of two F_4 lines. Two new varieties of pearl millet, Texas 7 and Georgia Hybrid 1, outyielded the common variety.

2728 Buntuš, T. A. & Jašovskij, I. V.
(Sorghum, a valuable forage plant).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1958 : No. 5 : 52–57. [Russian].
This article, dealing with the cultivation of sorghum, refers to breeding aims and trials of hybrids between sorghum and Sudan grass at Odessa. The best F_1 hybrids outyielded Sudan grass by 15%.

2729 Hartley, W.
Studies on the origin, evolution, and distribution of the Gramineae. II. The tribe Paniceae.
Aust. J. Bot. 1958 : **6** : 343–57.
A world distribution map of the Paniceae has been prepared, based on the percentage frequency of species belonging to the tribe in the total grass flora of each region [cf. 419]. The map shows that the relative specific differentiation is higher in the western hemisphere than in the eastern and that a zone of maximum concentration of members of the tribe is to be found in north-eastern South America. The evolutionary significance of this distribution pattern is discussed and it is shown that the taxonomic evidence does not support a New World origin of the tribe. The high relative specific differentiation in the western hemisphere reflects the occurrence of numerous species of two or three large genera which are represented by much fewer species in the eastern hemisphere. The distribution of the Paniceae is closely related to winter temperature and annual rainfall in the USA and other regions. The Paniceae and Andropogoneae both appear to be natural tribes, which probably originated from a common panicoid stock in the warmer parts of the eastern hemisphere, possibly in the East Africa - Madagascar region. Attention is drawn to the differences between the two tribes in climatic adaptation. While both tribes reach their highest development in hot, moist climates, the Paniceae are characteristic of regions with a long wet season such as are found in the equatorial belt, while the Andropogoneae reach their highest relative frequency in monsoon climates.

2730 Harlan, J. R. & Ahring, R. M.
Caddo switchgrass.
Bull. Okla. agric. Exp. Sta. 1958 : No. B–516 : Pp. 8.
Detailed information is given on *Panicum virgatum* 'Caddo', developed by mass selection among collections from central Oklahoma and other parts of the southern Great Plains [XXVII, 3410].

2731 Chatterjee, B. N. & Richharia, R. H.
Studies on some of the promising strains of *Pennisetum pedicellatum*, Trin.
Proc. Bihar Acad. agric. Sci. 1955 : **4** : 126–28.
Information is given on five strains of *P.*

pedicellatum with respect to several morphological characters, number of days between sowing and flowering, and yield, as observed at the Bihar Agricultural College, Sabour. Four of the strains were selected from Nigerian introductions while the fifth originated from material collected in Chota Nagpur.

2732 Pantulu, J. V.
A case of chromosomal interchange in pearl millet.
Curr. Sci. 1958 : **27** : 497–98.

In an investigation at the Department of Botany, Andhra University, a reciprocal translocation was found in the F_1 hybrid Gahi 1 of *Pennisetum typhoides*, developed in the USA [cf. XXIX, 424]. Cross-shaped configurations were observed at pachytene. Study of pachytene chromosomes in local strains of the same species showed that the seven pairs may be classified into the following groups: (1) two pairs which have the greatest length and median centromeres, (2) two pairs with median to submedian centromeres and smaller in size than (1), (3) two medium-sized pairs with submedian centromeres and (4) one pair of nucleolar organizers. Two chromosomes respectively belonging to groups (2) and (3) are regarded as being involved in the segmental interchange. At diacinesis, some cells had a ring of $4 + 5_{II}$ and others a chain of $4 + 5_{II}$. Of the two possible types of orientation of the ring at metaphase I, only the open type was seen.

2733 Harlan, J. R. & Ahring, R. M.
Coronado side-oats grama.
Bull. Okla. agric. Exp. Sta. 1958 : No. B–515 : Pp. 11.

Detailed information is given on *Bouteloua curtipendula* 'Coronado', selected from a collection made in New Mexico [XXVI, 3414].

2734 Voznyj, I. D.
(The *Agropyron glaucum* variety Rostov 31).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 4 : 64–66. [Russian].

The above strain of *A. glaucum* var. *genuinum* was bred from wild forms found in the province of Rostov. It is characterized by good tillering, winter hardiness, drought resistance and a high yield of green matter.

LEGUMINOUS FORAGE PLANTS

2735 Berger, C. A., Witkus, E. R. & McMahon, R. M.
Cytotaxonomic studies in the Leguminosae.
Bull. Torrey bot. Cl. 1958 : **85** : 405–15.

Root tips of seedlings of 79 species from 55 genera representative of the subfamilies Mimosoideae, Caesalpinioideae and Papilionoideae were examined for polyploid divisions. Such divisions were frequently observed in all the species belonging to the Mimosoideae. In the Caesalpinioideae only three genera showed polyploid divisions: *Cassia*, *Delonyx* and *Parkinsonia*. In the Papilionoideae, polyploid divisions were found only in *Aeschynomene* spp. It is suggested that the presence or absence of polyploid divisions in the root meristem of diploid species may provide a useful taxonomic criterion.

2736 Böjtös, Z.
Novodobé otáky šľachtenia motýľokvetých stebelnatých krmovín. (**Modern problems of breeding leguminous forage plants productive of stems**).
Pol'nohospodárstvo 1957 : **4** : 1209–26.

Modern methods of breeding lucerne and other leguminous forage plants, in particular the uses of polycross testing for the production of synthetic varieties and F_1 hybrids from self-sterile components, are discussed. Tabulated information relating to research with lucerne carried out along these lines at Martonvásár, Hungary, is presented.

2737 Teittinen, P.
Sinimailasen kantakokeet Kasvinviljeyllaitoksella. (**Experiments with strains of lucerne at the Department of Plant Husbandry**).
Maatalous ja Koetoiminta 1958 : **12** : 257–64.

A number of Finnish and foreign strains are compared with Tammisto red clover for hardiness and yield. Among the hardier varieties, the best yields were from the strains Jokioinen, Canadian Grimm and Hinderupgaard. Very high hay yield and protein content is recorded for Bunyan, but overwintering was less successful over a three-year trial period.

2738 Smith, T. J., Gish, P. T., Camper, H. M., Jones, G. D. & Sears, R. D.
Alfalfa and red clover varieties in Virginia, 1946-56.
Bull. Va. agric. Exp. Sta. 1958 : No. 494 : Pp. 40.

A summary is presented of the results of tests

of named varieties of lucerne and red clover in different localities in Virginia.

2739 Buller, R. E., Valdiviezo G., R. & Garza T., R.
Comportamiento de variedades seleccionadas de alfalfa y recomendaciones para su mejoramiento en México. **(Performance of selected varieties of lucerne and recommendations for breeding in Mexico).**
Foll. téc. Secretaría Agric. Ganad., Méx. 1958 : No. 32 : Pp. 40.

Details are given of the performance of 36 varieties tested during 1952–57 in Mexico Valley, Toluca Valley and the Bajío. The best were the local varieties, a Spanish lucerne and varieties from the south-western USA, all pertaining to *Medicago sativa*; those from the northern USA and Canada were less well adapted, chiefly because of their dormancy and slow growth during the winter. The chief breeding requirements are resistance to leaf diseases together with rapid growth and good persistence. The high-yielding, persistent local variety Tanhuato is being used as a basis for breeding. Descriptions are given of the following recommended varieties: Tanverde, Valdura and Hojaseo [cf. XXVIII, 1763], Caliverde [cf. XXIV, 1142], Oaxaca, Africana, Velluda Peruana [Hairy Peruvian] and Arizona Chilena.

2740 Kornilov, A. A.
(Continuously improving the methods of breeding perennial forage plants).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 4 : 8–13. [Russian].

The writer joins in the discussion of breeding methods carried on by various Soviet plant breeders; he agrees with Ovčinnikov's views on selection [cf. 399]. The recommendation of the All-Union Forage Institute to employ intravarietal and intervarietal hybridization in conjunction with directed training but without any form of selection is thought to be responsible for the meagre results in breeding new productive varieties in recent years. The value of some new varieties of forage plants such as the lucernes Čkalov 57 and Taškent 1, which were obtained by hybridization and training without selection, is still unknown. Various methods of selection among hybrid populations and varieties have given good results in the past and some high-yielding selections of *Agropyron*, lucernes and sainfoin are cited in support of the thesis. The lucernes include the hardy and drought-resistant variety Dolino 2, which was developed by the writer.

2741 Adams, M. W.
Events associated with introgression of root proliferation into domestic alfalfa.
Agron. J. 1958 : **50** : p. 761.

In 1912, two adjacent fields in S. Dakota were respectively sown with *Medicago media* 'Cossack' and an introduction of *M. falcata* from Semipalatinsk, Siberia. The latter type was known to show root proliferation in occasional plants. The fields were managed for forage or seed production until 1954. In 1950, eight root-proliferating plants were discovered in the field of Cossack, each with yellow or variegated flowers, few ovules per ovary, sickle-shaped pods and a pronounced habit of dormancy. All the other plants in the field were noncreeping. The root-proliferating individuals varied in $2n$ number from 32 to 35. The plant (K2) with $2n = 35$ was 100% ♀ sterile and 85% ♂ sterile, although producing flowers abundantly. Female sterility was due to ovule collapse in self or cross pollination; ♂ sterility was due to pollen abortion. A plant with $2n = 33$ was normal in fertility. Plants from a cross with K2 as ♂ had $2n = 32$. In an attempt to explain the origin of the root-proliferating individuals, two hypotheses are discussed. (1) A natural cross occurred between a tetraploid ($2n = 32$) Cossack as ♀ and a diploid of *M. falcata*. The resulting triploid could have given rise to functional gametes with chromosome numbers from 8 to 22, according to the conclusions of Ledingham [cf. X, 467]. If certain of these were fertilized by 16-chromosome ♂ gametes, plants with $2n = 32$ and a few with the observed aneuploid numbers of 33 and 35 would have been produced. No diploids were however found in the field of the Semipalatinsk population, although this failure does not imply that such plants could not have been present earlier. (2) The more probable explanation may be that a 32-chromosome root-proliferating plant in the Semipalatinsk field crossed as ♂ with one or more tetraploid plants of Cossack. Since Cossack originated by natural crossing between *M. falcata* and *M. sativa*, close homology of some of the chromosomes of the Semipalatinsk type with some of those of Cossack could be expected. The hybrids may therefore have behaved as segmental allopolyploids. As a consequence of meiotic irregularities, functional ♀ gametes carrying one or more extra chromosomes may have been produced. A single back cross to the

Semipalatinsk type could have restored the preponderance of characteristics of *M. falcata.*

2742 Canode, C. L.
Natural selection within Ranger alfalfa.
Res. Bull. Idaho agric. Exp. Sta. 1958 : No. 39 : Pp. 15.

A detailed account is given of the results of investigations which have already been summarized elsewhere [XXVIII, 597].

2743 Hanson, C. H.
Clonal vs. seedling establishment as a factor affecting yield of alfalfa.
Agron. J. 1959 : **51** : p. 58.

It is sometimes necessary in genetic studies to compare the yield data of plants which have been propagated in different ways. It was therefore considered useful to investigate the effects of clonal and seedling establishment on the subsequent yield of forage in three populations of lucerne. In an experiment carried out at the North Carolina Experiment Station, the yields of clonally propagated plants tended to be lower than those of seedlings in the first and second harvests following establishment but after two years there was very little difference in yield.

2744 Bjälfve, G.
Om luzernstammars uthållighet och avkastning vid 3 och 4 slåttrar pr år. (**On the persistence and yield of lucerne strains subjected to 3 and 4 cuts per year**).
Sverig. Utsädesfören. Tidskr. 1958 : **68** : 279–83.

In trials conducted at Ultuna, central Sweden, over the period 1953–57, Grimm, North-Rhizoma and Sv45–96 were more persistent and generally gave higher yields of green and dry matter than du Puits and Alfa, both when three and when four cuts a year were made.

2745 Peake, R. W., Cormack, M. W. & Downey, R. K.
Evaluation of alfalfa for resistance to bacterial wilt in field and greenhouse tests.
Canad. J. Pl. Sci. 1958 : **38** : 405–14.

The methods and results of the large-scale field and greenhouse tests used in assessing resistance to bacterial wilt (*Corynebacterium insidiosum*) at the Lethbridge Experimental Farm, Alba., are described. In the field tests, rooted cuttings or seedlings were inoculated by the "bare-root soak" method before planting in May and then inoculated again in the autumn by hypodermic injection of each root. In the greenhouse tests, the "root-ball soak" method was used, observations on infection being recorded three months later. The field tests required 12–18 months for completion. Greenhouse tests gave results as reliable as those from field tests and were especially useful for rapid, preliminary screening. Advantages of the field tests are the higher degree of damage suffered by susceptible plants and the opportunity for simultaneous rating of wilt resistance, growth habit, winter hardiness and other characters.

2746 Johnson, E. C.
Inheritance studies, including reaction to certain foliage diseases, in alfalfa.
Diss. Abstr. 1958 : **19** : LC Card Mic 58–2154 : 12–13. (Abst.).

Eleven clones, their single crosses in both directions, the open-pollinated progenies of ten of the clones and nine commercial varieties were studied in the field at the University of Minnesota for reaction to leaf and stem diseases and for winter survival. Differences in response to *Pseudopeziza medicaginis* were highly significant between clones, between single crosses and between commercial varieties. Data from certain crosses between resistant and susceptible parents suggested at least partial dominance of resistance. Differences in reaction to *Cercospora zebrina* were significant among clones and among single crosses. Disparities in response to *Stemphylium botryosum* (*Pleospora herbarum*) and *Pseudoplea trifolii* were significant among clones, among both types of progeny and among commercial varieties. Parent-progeny correlations for reactions to all these pathogens were highly significant and heritability values considerable. Resistance to stem blackening behaved as a highly heritable character when the disease was caused largely by *Phoma herbarum* var. *medicaginis*. When such blackening was produced by several organisms acting at the same time, parent-progeny correlations were nonsignificant and heritability estimates low. Differences in foliage yellowing due to leaf hopper were significant between clones and between single crosses; significant parent-progeny correlations and the estimates of heritability indicated that breeding for resistance is practicable. Highly significant parent-single cross correlations and high heritability estimates were obtained for percentage leaf loss as a character, differences being highly significant among clones and among single crosses. The data showed that factors other than foliage diseases were also important in leaf loss. Winter

injury, autumn dormancy and summer erectness of growth were closely associated, with high heritability values and highly significant parent-progeny correlations. The most winter-hardy plants tended to be the most dormant in autumn and least erect in summer, but not all autumn-dormant plants were correspondingly hardy. "Significant correlation of characters in progeny populations was observed. These correlations appeared to result from the occurrence together of the particular characters in the parent clones. Since these correlations were determined from progeny means, the relationship of characters in the parental clones would be expected to occur also in their first generation progenies. Correlation values were lower when computed from individual plant data than when computed from plot means of the same data."

2747 Adams, M. W. & Semeniuk, G.
A comparison of predicted with realized gain from selection for leafspot resistance in alfalfa.
Agron. J. 1959 : **51** : 91–92.

Twelve plants were selected for resistance to leaf spot (*Pseudopeziza medicaginis*) from families derived from a set of diallel crosses and comprising a population of 932 plants. The 12 selections were then randomly intercrossed to produce a new population of half-sib families. Individual-plant reactions to leaf spot in this population were recorded on the basis of a scale of 1 to 9, the lower numerical scores indicating lower degrees of infection. The predicted mean score of the whole population was 2·39, whereas the actual mean score was 2·06. The difference of 0·33 between the expected and realized gains is the same as the standard deviation of the population mean. The predicted value is therefore well within the range which could have been expected by chance. The discrepancy may be most satisfactorily attributed to errors in the procedure of estimation and to the assumptions of disomy, randomness and genetic relationship implicit in the analysis. The failure to detect additive genetic variance among the selections or their intercross means suggests that a simple type of inheritance of leaf-spot reaction prevails in this material.

2748 Harvey, T. L. & Hackerott, H. L.
Spotted alfalfa aphid reaction and injury to resistant and susceptible alfalfa clones reciprocally grafted.
J. econ. Ent. 1958 : **51** : 760–62.

Survival and reproduction of *Therioaphis maculata* were unaltered on scions or stocks of reciprocally grafted resistant and susceptible clones. Properties involved in antibiosis or nonpreference were therefore not transferable across the graft. The use of grafting experiments to determine whether plants vary in degree of vein banding because of differences in tolerance of aphid-injected toxin or because of differences in feeding attributable to antibiosis or nonpreference is suggested.

2749 Valle, O.
Puna-apilan siemenkysymyksemme keväällä 1957. (**The question of our red clover seed in the summer of 1957**).
Koetoiminta ja Käytäntö 1957 : **14** : p. 3.

In a comparison of native Finnish and foreign strains of red clover, some comparative data are reported for yield; they show the superiority of the native variety Tammisto over both Swedish material and the Canadian Altaswede.

2750 Valle, O.
Kokemuksia tetraploidista puna-apilasta Suomessa. (**Observations on tetraploid red-clover in Finland**).
Maatalous ja Koetoiminta 1958 : **12** : 250–56.

Two tetraploids, Rea, developed from Danish Hersnap red clover, and 4036, from Ultuna, are compared with the standard variety Tammisto. Rea shows a poorer yield especially in second-year leys than Tammisto and is also less hardy. U036 overwinters well and is very resistant to *Sclerotinia*. Its yield averages 19% higher than Tammisto, and this is partly due to high yields in second and third year leys.

2751 Whittington, W. J.
Asynapsis in red clover.
J. Hered. 1958 : **49** : p. 202.

Examination of a plant found to be sterile as ♂ or ♀ parent revealed the ♂ sterility to be due to asynapsis, 6–10 microcytes being formed. No pairing of any of the chromosomes was observed. Since pollen grains from other plants germinated on the stigma and their tubes reached the ovary, it appears that the ♀ sterility was also the result of abnormal meiosis.

2752 Stählin, A. & Bommer, D.
Über die Wege zu einer besseren Befruchtung des Rotklees. (**Ways towards the better fertilization of red clover**).
Angew. Bot. 1958 : **32** : 165–85.

Literature on the above problem is reviewed, special attention being given to the results of investigations on the possibilities of encouraging honey bees as pollinators by (*a*) increasing nectar production by means of suitable manuring treatments so that the nectar level in the corolla tube is high enough to be reached by bees and

(*b*) breeding red clover varieties with short corolla tubes and high nectar production.

2753 Diachun, S. & Henson, L.
Protection tests with clones of red clover as an aid in identifying isolates of bean yellow mosaic virus.
Phytopathology 1958 : **48** : 697–98.

The various reactions of six clones of Kenland red clover to four isolates of bean yellow mosaic virus are described. It was found that plants of clones KyC71–8 or KyC71 infected with any of 3 isolates of the virus were protected against both local and systemic infection by another isolate 204–1. These tests also indicate that the four isolates are related.

2754 Morley, F. H. W.
Effects of strain and temperature on the growth of subterranean clover (*Trifolium subterraneum* L.).
Aust. J. agric. Res. 1958 : **9** : 745–53.

Growth was evaluated by means of relative growth rate (R) and net assimilation rate based on leaf area (E_a) and on leaf weight (E_w) during part of the vegetative stage, the behaviour of Tallarook, Clare, Yarloop, Wenigup and Bacchus Marsh at 16·8, 18·6 and 24·2° C. being determined. The plants were exposed to one of two pretreatment temperatures (24·2° C. and unheated glasshouse). Temperature, strain and strain x temperature interactions were significant for R, E_w and E_a, the interactions being much greater for R than for E_w or E_a. Pretreatment temperature affected R and to a lesser degree E_w, but not E_a. The pattern of response to temperature differed markedly among the strains, optimum temperatures for growth being higher in Wenigup and Clare than Tallarook and Yarloop. Bacchus Marsh showed little response to temperature. Strain differences in relative growth rate were determined largely by disparities in E_a rather than by differences in leaf area : plant weight ratio. The significance of these results is discussed in relation to strain evaluation.

2755 Yates, J. J.
Seed-setting in subterranean clover (*Trifolium subterraneum* L.). II. Strain-environment interactions in single plants.
Aust. J. agric. Res. 1958 : **9** : 754–66.

Single potted plants of strains representing a range of maturity types were grown in two environments: (1) cool and moist and (2) hot and dry but with frequent watering of the roots. Growth and burr and seed production were so poor among the earlier strains in (2) that data on these strains were however omitted. In (1) the early-maturing strains buried a high proportion of burrs and the late-maturing ones relatively few. In (2) the late types buried the majority of their burrs. Seed setting in buried burrs was generally good and relatively constant in all the strains and in the two environments. Capacity to set seed above the ground varied widely among the strains and within each strain was greater in the first environment. In (2) a positive correlation was found between seed setting above the ground and leafiness; it is presumed that this relationship was partly due to amelioration of the microenvironment by the foliage. Except in the case of two strains, data from (1) conformed to the expectation that ability to set seed above the ground would be inversely related to burr burial; this association is interpreted on the basis of natural selection. The microenvironment and differential response of strains affected not only the number of seeds per inflorescence but also the weight and viability of the seeds. Inherent differences in seed weight among strains were at least partly due to differences in a threshold embryo weight for viability. The bearing of these results upon problems of breeding is discussed.

2756 Bennett, H. W.
The effectiveness of selection for the hard seeded character in crimson clover.
Agron. J. 1959 : **51** : 15–16.

Rigorous selection for hard seededness in common crimson clover was carried out using two mass screening techniques. The "water-soak method", which involved saving the seeds which were not swollen after bulk soaking in water for three days, was more effective than the "field volunteer method". Progeny lines with an increased percentage of hard seed were obtained. Reselection within these lines by the water-soak method further increased the average percentage of hard seed and the upper limit of the range of hard seededness. The increase in percentage and degree of hard seededness was so pronounced that it indicated that this character is inherited.

2757 Sekizuka, S., Yosiyama [Yoshiyama], T. & Hojito, S.
(Studies of native wild forage plants. III. On the characteristics of Japanese *Vicia sativa*, in particular, a comparison with foreign vetches).
Kantotosan Nogyo Shikenjo Kenkyu Hokoku/J. Kanto-Tosan agric. Exp. Sta. 1958 : No. 11 : 58–74. [Japanese].

A description of the morphological and

agronomic characteristics of a collection of Japanese strains is presented. Although the Japanese strains tend to grow less vigorously than the occidental type in the early stages of development, they set seed better under rainy conditions. The Japanese strains differ among themselves in quantitative morphological characters and vegetative rhythm. Though the chromosome numbers of the Japanese and occidental forms are identical ($2n = 12$), chromosome morphology is diverse. Five strains, Nasu 1 to 5, have been selected, the first of which is especially recommended for high yielding capacity and resistance to cold and disease.

2758 Mettin, D.
Zur Morphologie der Chromosomen von *Vicia sativa* L. (**The morphology of the chromosomes of *V. sativa* L.**).
Kulturpflanze, Berlin 1958 : **6** : 116–22.

An illustrated account is presented of the chromosomes of *V. sativa*, data being provided on the relative lengths of the long and short arms of the chromosomes. One of the chromosomes (III) has a submedian centromere and the other five have subterminal centromeres; chromosomes I and IV have satellites. The numbering of the chromosomes conforms to the proposed international rules.

2759 Donnelly, E. D.
Inheritance of white flower color in common vetch, *Vicia sativa*.
Agron. J. 1958 : **50** : 763–64.

Purple flowers were completely dominant to white and depended upon a single gene.

2760 Manner, R.
Studies on seed-setting in leguminous plants. II. Vetches.
Maataloust. Aikakausk. 1958 : **30** : 158–71.

A large number of characters affecting seed yield were studied in three varieties of *Vicia sativa* and two hybrids involving these varieties as parents at the Gullåker Plant Breeding Institute, Hammenhög, Sweden. Genetical differences in the characters studied are described as large.

2761 d'Alleizette, C.
Une variété du *Vicia melanops* S. et Sm. en Auvergne. (**A variety of *V. melanops* S. and Sm. in Auvergne**).
Bull. Soc. bot. Fr. 1958 : **105** : 360–62.

A botanical description is provided of a variety found near Clermont; it is taller and more erect than *V. melanops*, the colour and morphology of the flowers also being different.

2762 Thombre, M. V.
Interspecific hybridization between *Mucuna pruriens* DC. and *Mucuna cochinchinensis* A. Chev.
Curr. Sci. 1958 : **27** : 498–99.

The wild species *M. pruriens* has dark purple flowers and bristles on the pod and calyx which cause irritation to the human skin. The cultivated species *M. cochinchinensis* bears pale purple flowers and long, smooth pods without any bristles. Crosses were made at the College of Agriculture, Poona, with the aim of introducing the hardiness of the wild species into *M. cochinchinensis*. The F_1 hybrids were intermediate between the parents with respect to flower colour, pod size, seed size and bristles. The brown seed colour of *M. pruriens* was dominant over the whiteness of the seeds of *M. cochinchinensis*. Both parents had $2n = 22$ and normal meiosis.

2763 Brinkley, R. M., Hanson, C. H. & Cope, W. A.
Growth and morphological characteristics of induced autotetraploids of *Lespedeza cuneata*, *L. stipulacea* and *L. striata*, and interfertility of these species at diploid and tetraploid levels.
Agron. J. 1959 : **51** : 143–47.

Colchicine-induced tetraploids of the above three species had larger leaflets, stems, flowers and seeds and lower yields of forage and seed than the respective parental diploids. The reduction in seed yield associated with tetraploidy was greater in *L. cuneata* than the other two species. Pollen-grain diameter was uniformly greater in the tetraploids. As shown by observations on $2x$ and $4x$ *L. cuneata*, percentage of stainable pollen was not associated with seed yield. Within both the diploid and tetraploid forms of this species, seeds from chasmogamous flowers were larger than those from cleistogamous flowers. Progenies from the former type of flower yielded more forage than progenies from the latter, evidence of heterosis thus being provided since outcrossing occurs only in chasmogamous flowers. The greater seed size associated with chasmogamy did not appear to be responsible for the higher yield, since yield estimates were made in the second year after planting. Seeds from the two types of flowers could not be accurately distinguished in the other two species. No hybrids were obtained from crosses of *L. cuneata* with the other two species, using various combinations of $2x$ and $4x$ parents. The combinations

differed, however, in the proportion of pollinations resulting in pod setting. In general, the most compatible matings were those in which *L. stipulacea* was used as the ♀ parent. *L. stipulacea* (2*x*) ♀ x *L. cuneata* (2*x*) gave the highest percentage pod set. Embryological investigation of this cross indicated that fertilization had taken place but that collapse of the ovule began as early as the sixth day after pollination. This collapse is attributed to endosperm failure.

2764 Hanson, C. H., Cope, W. A. & Brinkley, R. M.
Chemical changes in *Lespedeza* associated with induced polyploidy.
Amer. J. Bot. 1959 : **46** : 36–39.

The material used in these studies conducted at the North Carolina Agricultural Experiment Station included autotetraploids of *L. cuneata*, *L. latissima*, *L. stipulacea* and *L. striata* and the amphidiploids *L. hedysaroides* x *L. cuneata* and *L. latissima* x *L. cuneata*. *L. stipulacea* and *L. striata* are annuals with low concentrations of tannin, the other species being perennials of high tannin content. In general, lower contents of crude protein, P and Ca and higher contents of K and tannin were found in the leaves of the polyploids than in those of the corresponding diploid parents; the most significant differences were in the total tannin content. Induced polyploids of *Lespedeza* do not appear to be promising as forage plants.

2765 Donnelly, E. D.
The effect of season, plant maturity, and height on the tannin content of sericea lespedeza, *L. cuneata*.
Agron. J. 1959 : **51** : 71–73.

A study was made of the effects of the above factors at the Agricultural Experiment Station of the Alabama Polytechnic Institute, since they may affect the selection of low-tannin plants, particularly if the plants are cut back several times during the season for subsequent measurement of aftermath production. Tannin content increased as the season advanced, that is, as the mean day temperature increased and precipitation decreased. Tannin content also increased with plant maturity. Plant height and tannin content were not associated.

2766 Greenshields, J. E. R.
Note on Cumino sweet clover.
Canad. J. Pl. Sci. 1958 : **38** : 507–08.

Detailed information is given on the characteristics of the coumarin-free synthetic Cumino and on the methods employed in breeding it [XXVIII, 4350].

2767 Lamberts, H.
Chemical strains in yellow lupins (*Lupinus luteus*).
Pharm. Weekbl. 1957 : **92** : 825–29.

In this review mention is made of the three recessive genes *d*, *a* and *l*, controlling low alkaloid content in lines 8, 80 and 102 respectively [cf. 452]. Strain 102 has the lowest alkaloid content and an even lower content is found in the double recessive *ddaa* from 8 x 80.

2768 Srivastava, M. G.
Cytotaxonomic position of *Crotalaria Brownei* Bert. ex DC.
Cytologia, Tokyo 1958 : **23** : 193–99.

Caryotypical analysis of *C. brownei* and *C. saltiana* (*C. striata*) confirmed the view that the former species should not be merged with the latter. The chromosome number ($2n = 16$) of *C. brownei* is reported for the first time.

2769 Donovan, L. S., Magee, A. I. & Kalbfleisch, W.
A photoelectric device for measurement of leaf areas.
Canad. J. Pl. Sci. 1958 : **38** : 490–94.

The device described has been successfully used in a genetic study of leaf size in birdsfoot trefoil. "Leaves are placed between a fluorescent light source, high in the red spectrum, and a photocell covered with an F29 red light filter. The reduction in output of the cell, as measured by a galvonometer, is interpreted in terms of area."

2770 Callen, E. O.
Studies in the genus *Lotus* (Leguminosae). I. Limits and subdivisions of the genus.
Canad. J. Bot. 1959 : **37** : 157–65.

The author gives reasons for including *Tetragonolobus* and *Hosackia* in *Lotus* and for discarding *Dorycnium* and *Bonjeania*. Four subgenera of *Lotus* are proposed, characters of the style other than size being used in separating them: *Pedrosia*, *Edentolotus* (including sects. *Euhosackia* and *Syrmatium*), *Deflectostylus* (including sect. *Acmispon*) and *Tetragonolobus*. On this basis, about half the N. American species fall into the second subgenus and the remainder into the third.

2771 Bubar, J. S. & Lawson, N. C.
Note on inheritance of ability to survive winter-killing conditions in birdsfoot trefoil.
Canad. J. Pl. Sci. 1959 : **39** : 125–26.

According to observations on North American varieties and introductions of *Lotus corniculatus* from Russia and elsewhere and on progenies of crosses involving this material at Macdonald

College, Quebec, the capacity of winter survival is dominant or partially dominant. No indications of killing due to heaving or disease were evident and the cause of the killing observed could not be determined.

2772 Lipaeva, L. I.
(The significance of polyploidy in plant evolution).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) : Otdel biol. (Biol. Ser.) 1958 : **63** : No. 5 : 146–49. [Russian].

Chromosome determinations on 28 species of *Astragalus* showed the majority of them to have $2n = 16$. Polyploid sectors were found in the roots of *A. pulcher*, *A. platyphyllus* and *A. brevidens*, all species growing at high altitudes. However, polyploid species occurred both in areas with high and low elevations, namely *A. macropterus* ($2n = 32$) and *A. hemiphaca* ($2n = 64$) in the Tien Shan and *A. physodes* ($2n = 24$) and *A. cicer* and *A. onobrychis* ($2n = 64$) in the plains.

2773 Britten, E. J.
A chlorophyll mutation in *Indigofera endecaphylla*.
Agron. J. 1959 : **51** : 182–83.

A sectorial chimera, part of which was a normal green colour and the remainder albino, was found in the X_1 of a plant which had been exposed at the flowering stage to γ radiation from a Co^{60} source. The mutant died before seed was produced or before the chlorophyll-deficient parts could be investigated cytologically or anatomically. Since the albino portion was fairly extensive, the mutation must have occurred early in embryonic development.

ROOTS AND TUBERS

Polyploidie der Rüben. Beiträge zur Rübenforschung Nr. 1. **(Polyploidy of beets. Contributions to beet research No. 1).**
Wiss. Abh. dtsch. Akad. LandwWiss. Berlin 1958 : No. 34 : Pp. 68.

2774 *Rosenthal, C. Ein Vergleich der Methoden zur Gewinnung polyploiden Ausgangsmaterials für die* Beta*-Rübenzüchtung. (A comparison of methods for obtaining initial polyploid material for* Beta *breeding. (pp. 7–27).*

Mangel plants were treated with colchicine during either the first or second year of growth. Treatment applied to very young growing points gave the highest percentage of tetraploid C_1 plants; treatment of germinating seed balls is recommended. Polyploid inflorescences on C_0 plants could be distinguished by the size of the pollen. In relation to the experimental results, the development of the growing point and the formation of chimeras in treated plants are discussed.

2775 *Fürste, W. Massnahmen zur Erhöhung des Anteils triploider Pflanzen in polyploiden Zuckerrüben. (Measures for raising the proportion of triploid plants in polyploid sugar beets). (pp. 28–36).*

In this review, mention is made of work showing that triploid sugar beet can outyield diploids and tetraploids; triploids produced by crossing tetraploids and diploids show heterotic effects. Various ways of increasing the proportion of triploids produced in such crosses are discussed. These methods include selecting parents in which cross fertilization rather than self fertilization is favoured, and using male-sterile plants. Technical measures are also considered; for example, the numerical ratio of the $2n$ and $4n$ parents influences the proportion of triploids produced.

2776 *Fischer, H. E. Erfahrungen in der Anwendung von Mitosegiften zur Gewinnung polyploider Pflanzen, insbesondere* Beta*-Rüben. (Experiences in the application of mitotic poisons for obtaining polyploid plants, especially* Beta*). (pp. 37–51).*

Work with different mitotic-spindle poisons is reviewed. Experiments with leguminous plants are described; these show that γ-hexachlorocyclohexane (HCH) is only successful in inducing polyploidy when crystals are placed in direct contact with the tissues but the vapour of acenaphthene (ACE) is effective on some plants [cf. XXVII, 617]. Both these substances are recommended for the production of polyploid beets, experiments having been carried out with sugar beet and mangel. Methods of treatment using ACH and ACE are discussed. Sodium hexanitrodiphenylamine also induced polyploidy in beets but frequently damaged the plants.

2777 *Bandlow, G. Die Pollensterilität der* Beta*-Rübe und ihre Bedeutung für die Polyploidiezüchtung. (The pollen sterility of* Beta *and its importance for polyploidy breeding). (pp. 52–68).*

Instances of pollen sterility found in sugar beets are listed and the degeneration of the pollen and the genetical basis of pollen sterility are described. Also heterosis experiments using male-sterile plants are reviewed. In Germany, some pollen parents have been identified which produced completely pollen-sterile progenies in

crosses with male-sterile plants, so making possible the maintenance of pollen-sterile lines. The breeding of polyploids is considered, reference being made to the production of triploid seed using male-sterile seed parents.

2778 Josefsson, A.
Torrämnets sammansättning hos olika rotfruktsslag och olika stamtyper. (**Composition of dry matter in different species and varieties of root crops**).
Sverig. Utsädesfören. Tidskr. 1958 : **68** : 220–26.

Data on the contents of dry matter, sugar, crude protein, crude fibre and ash are included for varieties of mangel, sugar mangel, sugar beet and turnip grown at Svalöf, Sweden. Varietal differences between swedes were slight.

2779 Bergman, B. H. H.
Het bietencystenaaltje en zijn bestrijding. V. Enige microscopische waarnemingen betreffende de ontwikkeling van larven van *Heterodera schachtii* in de wortels van vatbare en resistente planten. (**The beet eelworm and its control. V. Some microscopic observations on the development of larvae of *H. schachtii* in the roots of susceptible and resistant plants**).
Meded. Inst. rationele SuikProd. 1958 : **29** : 151–68.

Upon inoculation, larvae of *H. schachtii* penetrated the roots of the resistant plants *Beta patellaris* and *Hesperis matronalis* but failed to develop, while in the susceptible *B. vulgaris* and *B. macrocarpa* complete development of the larvae occurred together with the formation of giant cells in the host tissues. Necrosis of the tissues surrounding the larvae was seen in *B. patellaris* and to a much smaller extent in *H. matronalis*.

2780 Urban, R.
Betanine in den Sprossknospen einiger gelber Futterrübensorten. (**Betanins in the buds of the shoots of some yellow mangels**).
Züchter 1958 : **28** : 343–45.

In some yellow mangel varieties, the hypocotyls of seedlings and the new shoots from overwintered roots are red instead of yellow. At the Max-Planck Institute for Breeding Research, Ladenburg, Germany, the pigments in the new shoots of three varieties were analysed, using high-voltage ionophoresis; two betanins were found in red shoots. Other experiments showed that the pigments in the roots did not change during the winter. The possible genetical basis for this phenomenon is discussed. Two genes G and R are thought to be necessary for betanin formation [cf. **1683**]. The plants in question could carry G and R^+, other genetic factors being responsible for betanin formation in the hypocotyl and shoots but not in the skin of the root. Alternatively the plants could possess G and another allele R^n which makes possible the formation of betanins in the hypocotyl and shoots but not in the skin of the root.

2781 Lamser, V.
Neues in der tschechoslowakischen Rübenforschung. (**The latest Czechoslovak research on beets**).
Za socialist. sel'skohozjajstv. Nauk. (For socialist agric. Sci.), Praha : Ser. A. : 1958 : **7** : 373–88.

It was found that a high sugar content reduces the keeping capacity of sugar beet. The loss in weight during storage was found to be greater in red varieties of mangel than in yellow or orange types; this is because the red pigment is associated with a high rate of respiration. Also yellow types of fodder carrot keep better than red varieties.

2782 Iizuka, M.
(**Inbreeding and its effects in Cruciferous plants. An aneuploid turnip produced by bud pollination**).
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1958 : No. 8 : 88–97. [Japanese].

An aneuploid plant ($2n = 21$) was obtained among the progeny resulting from bud pollination of the turnip. It showed reduced fertility, compared with the diploid, in open, cross and bud pollinations.

2783 Varis, A.-L.
On the susceptibility of the different varieties of big-leafed turnip to damage caused by cabbage maggots (*Hylemyia* spp.).
Maataloust. Aikakausk. 1958 : **30** : 271–75.

Differences between varieties in susceptibility to *Hylemyia* spp. in tests in Finland are described. In the case of severe damage, root shape was an important consideration. Round or long-round types, generally having strong roots, were better in withstanding damage and in recovery than flat or flat-round types with thinner roots.

2784 Raghavan, R. S.
A note on *Coleus parviflorus* Benth.
Curr. Sci. 1958 : **27** : p. 448.

A variety with small tubers and another with

large tubers were identified in a collection from Kerala, S. India. Both varieties have $2n = 64$. Scheel has reported that *C. aromaticus* has $2n = 32$ and $x = 8$. *C. parviflorus* may therefore be regarded as an octoploid.

2785 **List of international potato research projects.**
Amer. Potato J. 1958 : **35** : 789–803; 1959 : **36** : 34–44.

Prepared by the International Relations Committee of the Potato Association of America, the list indicates the institutions engaged in potato research in countries other than the USA and Canada, the scope of current projects on breeding, genetics and other aspects, and the principal personnel.

2786 Hanninen, P.
Eräiden varhaisperunalajikkeiden vertailua. (**A comparison of certain early potato varieties**).
Koetoiminta ja Käytäntö 1958 : **15** : 13, 14, 15.

Varieties Doré, Jaakko, Siikli and Frühbote are compared for quantity and quality of tubers when lifted early or in autumn. Doré is outstanding for yield and percentage of marketable tubers when lifted early, but Siikli and Jaakko are more successful for autumn lifting. Doré is more prone to blight than the other varieties, and is also poorly resistant to virus disease.

2787 Virnes, E.
Varhaisperunan nostoaikakokeen tuloksia. (**Results of harvest-time trials with early potatoes**).
Maatalous ja Koetoiminta 1958 : **12** : 194–97.

A number of Finnish and foreign varieties are compared with Tammiston aikainen [Early Tammisto] for yield of commercial tubers at two harvest periods a fortnight apart. The Finnish Jaakko gave an excellent harvest at both dates, the German Sieglinde and Frühbote also being superior to Tammiston aikainen.

2788 Matsubayashi, M.
Studies on the species differentiation in the section *Tuberarium* of *Solanum*. III. Behavior of meiotic chromosomes in F_1 hybrid between *S. longipedicellatum* and *S. schickii* in relation to its parent species.
Hyogo Noka Daigaku Kenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. 1955 : **2** : 25–31.

The flower, leaves, stem colour, growth rate and meiotic behaviour of the F_1 hybrids from the cross *S. longipedicellatum* and *S. schickii* were compared with those of the parent species. The species crossed readily. The hybrids were intermediate in many morphological characters but were more similar to the tetraploid parent than to the diploid in general appearance. Both species showed meiotic irregularities and the F_1 hybrids showed $1_{III} + 11_{II} + 11_I$ as an average configuration at first meiotic metaphase. This mode of chromosome conjugation seems to be due mainly to allosyndetic pairing and therefore it is likely that *S. longipedicellatum* and *S. schickii* are closely related.

2789 Walker, R. I.
Chromosome behaviour in F_1 hybrids between *Solanum demissum* and three diploid species.
Bull. Torrey bot. Cl. 1959 : **86** : 31–40.

A study was made of meiosis in the F_1s of crosses of *S. demissum* with *S. gibberulosum*, *S. tarijense* and *S. schickii* and in the parental species. At metaphase I, 12_{II} were usually present in *S. gibberulosum* while in *S. tarijense* and *S. schickii* $11_{II} + 2_I$ were of frequent occurrence. Meiosis in *S. demissum* was irregular in that only 47% of the PMCs examined had 36_{II}, the remainder having $2–6_I$. The 48-chromosome hybrids obtained from the crosses of *S. demissum* with *S. gibberulosum* and *S. tarijense* had varying numbers of univalents, bivalents and multivalents, no cases of 24_I being observed. Two pentaploid hybrids were the result of the cross of *S. demissum* with *S. schickii*. Since dyad pollen grains were found in the latter species, it is assumed that such grains functioned in the production of the pentaploids.

2790 **Zeisig.**
Dtsch. Landw., Berl. 1959 : **10** : p. 50.

Zeisig (Aquila x Hilla) was bred at the Plant Breeding Institute of Gross-Lüsewitz, Germany. It is a late culinary potato suitable for cultivation in most places including peat soils. Zeisig is resistant to *Synchytrium endobioticum*, fairly resistant to leaf roll and mosaic and susceptible to Y and Y–Al viruses. The leaves are resistant to races 0 and 4 of *Phytophthora infestans* and possess average to low field resistance to races 1 and 1·4, the tubers being less susceptible. Zeisig shows average susceptibility to *Streptomyces scabies*. It gives a good average yield of white-skinned tubers with yellow flesh but a rather low yield of starch.

2791 Dobrodeeva, A. L.
(**Loss of contact with practice**).
Kartofel' (Potato), Moskva 1958 : No. 4 : p. 48. [Russian].

State variety testing is criticized for omission

of seedling 1750–4 from future trials. The seedling was bred at Ul'janovsk and is said to be earlier than Lorh and equal or superior to it in yield. The flavour and keeping properties of the tubers are good.

2792 Dos nuevas variedades de papa. **(Two new potato varieties).**
Idia 1958 : No. 127 : 29–30.

Buena Vista (Early Ohio x 18–1) has a maturation period of 90–100 days, is similar to Katahdin in starch and dry matter content, is superior in yield and shows good field resistance to leaf roll, moderate resistance to scab and resistance to *Fusarium*. Santa Rafaela, from Huinkul x Selecta Balcarce 13, has a maturation period of 130 days, resembles Huinkul in starch and dry matter content, is field-resistant to leaf-roll and mosaic viruses and resistant to *Fusarium* but susceptible to scab, and yields well, exceeding Huinkul in some areas. Both varieties were developed at the Balcarce Agricultural Experimental Station, Buenos Aires.

2793 Pérez Montenegro, J. E. & Estrada Ramos, N.
Monserrate, una nueva variedad de papa. **(Monserrate, a new potato variety).**
Agricultura trop. 1958 : **14** : 684–92.

Developed by the Colombian Department of Agricultural Research at Tibaitatá, from a cross between Branca Cascuda [Thick-skinned White] and Pana Blanca [White Plush], Monserrate yields up to 30% more than the commonly grown varieties Tocan, Tuquerreña and Ojona, is tolerant of blight, has a medium vegetative period, is good in quality and produces uniform tubers with shallow eyes and cream-coloured flesh and skin. The tubers may be stored for 3–5 weeks at 14° C.

2794 Robinson, R. G.
The use of north American potato varieties in New Zealand.
Amer. Potato J. 1959 : **36** : 70–72.

The North American potato varieties which have played an important part in New Zealand production are compared. The four most successful varieties occupy about 38·5% of the New Zealand potato area and three New Zealand varieties which were derived from Chippewa cover about 12·8%.

2795 Johansen, R. H., Sandar, N., Hoyman, W. G. & Lana, E. P.
Norland, a new red-skinned potato variety with early maturity and moderate resistance to common scab.
Amer. Potato J. 1959 : **36** : 12–15.

Detailed information is provided on the above variety [cf. 477] which was developed from Redkote [Pontiac (Katahdin x Triumph) x 116–10] x ND626 [Minn. 11–1–3–2 x ND179–68 (Minn. 15–2 x Pontiac)].

2796 Rubaševskaja, M. K.
(Local varieties from Krasnodar).
Kartofel' (Potato), Moskva 1958 : No. **4** : 49–50. [Russian].

Pestroklubnevyj [Variegated Tuber] from the district of Spokojnaja and Belosnežka [Snow White] from Gorjučij Ključ are regarded as mutations, the former of Lorh and the latter of Rannjaja Roza [Early Rose]. Pestroklubnevyj has red-spotted tubers, outyields Lorh, has a 2% higher starch content and shows improved earliness, resistance to drought and ring rot. The tubers are well shaped and their flavour is good. Belosnežka has white tubers and is characterized by uniform and abundant flowering. From Rannjaja Roza it is distinguished mainly by greater earliness and increased yield and starch content.

2797 Takayama, S.
(An arrangement of the inventory of potato varieties).
Hyogo Noka Daigaku Kenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. 1955 : **2** : 22–24. [Japanese].

A key is presented to assist in the identification of 65 varieties commonly grown in Japan.

2798 Anikeev, A. M.
(An early high yielding variety).
Kartofel' (Potato), Moskva 1958 : No. **4** : p. 57. [Russian].

The potato Carnikavskij (Kungla x Oktjabrenock [Little Octobrist]) was bred at the Latvian Breeding Research Station. It is earlier than Priekuli and yields 29% more tubers and 58% more starch per unit area. It is resistant to *Synchytrium* and moderately resistant to *Phytophthora* and *Alternaria*. The tubers are white and keep well.

2799 Johansen, R. H., Sandar, N., Hoyman, W. G. & Lana, E. P.
Nordak and Norgleam, two new white-skinned potato varieties with early maturity and field resistance to virus Y.
Amer. Potato J. 1958 : **35** : 774–77.

Detailed information on the above varieties is provided [cf. 477]. Both were developed from

Minn. 92.36–5 [Minn. 17–2 (*Solanum acaule* x 63–5S)] x Sebago (Katahdin x Chippewa).

2800 Swaminathan, M. S.
The origin of the early European potato—evidence from Indian varieties.
Indian J. Genet. 1958 : **18** : 8–15.

It is pointed out that local varieties in India were not subjected to a definite programme of selection or hybridization until 1935, when improvement at the Indian Agricultural Research Institute was initiated. Nor has much scope existed for natural hybridization since, with few exceptions, potato varieties rarely flower or fruit in the plains of India. Thus, although genetic changes may have arisen through somatic mutation and some varieties may have been the result of chance selection of seedlings the Indian varieties may be regarded as relics of the original introductions into the country and may thus be expected to throw light on the characteristics of varieties grown in Europe in the late sixteenth and early seventeenth centuries. The present study of the local varieties Phulwa, Gola and Darjeeling Red Round, in comparison with Up-to-date, was therefore undertaken. Since the local varieties have been found to possess the morphological characters usually attributed to *Solanum andigenum*, it is likely that the potatoes first introduced into Europe were from the Andean region, as postulated by Salaman. Reports of bolters in many cultivated varieties and the discovery of a probable long-day mutant of Phulwa by the author suggest that the genes governing photoperiodic reaction are relatively unstable. The conversion of short-day or day-neutral strains into long-day types may have been brought about by mutation. Meiosis was studied in Phulwa, the only variety flowering at Delhi. At metaphase I the mean configuration was $1{\cdot}2_{I} \pm 0{\cdot}27$, $14{\cdot}6_{II} \pm 0{\cdot}33$, $0{\cdot}533_{III} \pm 0{\cdot}15$ and $4{\cdot}0_{IV} \pm 0{\cdot}21$. Most European varieties contain 2 or 3 quadrivalents per cell at metaphase I; the higher frequency of quadrivalents in Phulwa may be due to the relatively unaltered condition of this variety with respect to the homology among the four sets of chromosomes, assuming the cultivated potato to be an autotetraploid [cf. XXIV, 2142, XXV, 2159]. It is suggested that an attempt to induce day-neutral or short-day mutants in the most desirable *S. tuberosum* varieties might be more profitable than attempting to improve the yield potential of local types by selection of hybrids between them and European and North American commercial varieties, particularly as the semiwild characters of the Indian varieties are dominant. The former approach, which is receiving attention at the Indian Agricultural Research Institute, will however only be feasible if no positive correlation is found between long-day response and high tuber yield.

2801 Toxopeus, H. J.
Chromosoom-verdubbeling bij diploide cultuuraardappelen. (**Chromosome doubling in diploid cultivated potatoes**).
Genen en Phaenen 1958 : **3** : 10–12.

Tetraploid hybrid forms have been produced (*a*) by treating a sterile F_1 triploid from diploid *Solanum chacoense* x tetraploid *S. stoloniferum* with colchicine and (*b*) by inducing chromosome doubling in a diploid and crossing with *S. tuberosum*. *S. tuberosum* resembles the artificial tetraploids and differs from diploids in having broader leaves and more regular arrangement of sepals than the latter and in being self fertile. It is suggested that *S. tuberosum* arose naturally, and may be continually arising, through chromosome doubling in diploids.

2802 Kawakami, K. & Matsubayashi, M.
Studies on potato breeding by polyploid hybrids between related species. II. On the morphological characteristics of induced tetraploid plants in some species belonging to the series *Commersoniana*.
Hyogo Noka Daigaku Kenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. 1954 : **1** : 131–36.

Chromosome doubling was induced by colchicine treatment of young seedlings or tubers of *Solanum chacoense*, *S. commersonii*, *S. gibberulosum*, *S. saltense* and *S. schickii*. Leaf characters, stomata, corollas, pollen grains, and plant height and width of the tetraploid plants and original diploid plants were compared. It is concluded that in these characters, excepting number of stomata, pollen fertility and plant height, the dimensions of the tetraploid plants were from 1·2 to 2·5 times greater than in the diploids. The tetraploids of a strain of *S. schickii* were notably different in their morphological characters from the diploids.
The pollen fertilities in the tetraploids of *S. commersonii* and *S. schickii* scarcely differ from those of the original diploids.

2803 Kawakami, K., Matsubayashi, M., Hiura, I. & Takayama, A.
Studies on potato breeding by polyploid hybrids between related species. I. The leaf smear method in identifying polyploid plants.
Hyogo Noka Daigaku Kenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. 1954 : **1** : 129–30.

A method for counting chromosomes similar to one previously described [cf. XXII, 34] is given. A young leaf approximately 3 mm. in size is used as the test material. It is stained in acetocarmine solution as opposed to acetoorcein used in the earlier method.

2804 Graham, K. M., Niederhauser, J. S. & Servin, L.
Studies on fertility and late blight resistance in *Solanum bulbocastanum* Dun. in Mexico.
Canad. J. Bot. 1959 : **37** : 41–49.

The material studied consisted of collections recently made throughout the range of the species in Mexico and Guatemala. The species has been found to be highly self sterile and to consist of cross-sterile and cross-fertile individuals which may occur not more than a few kilometres apart and sometimes even in mixed populations. Evidence has been obtained that in at least one area *S. bulbocastanum* is represented by both diploid and triploid forms. It is suggested that autotriploidy with its consequence of sterility, combined with the action of cross-incompatibility genes, may cause a considerable reduction in the reproductive ability of the species. Hybrids of *S. bulbocastanum* with *S. trifidum* and *S. pinnatisectum* were produced. Attempts to cross chromosome-doubled *S. bulbocastanum* with *S. tuberosum* and other tetraploid species have so far failed. After inoculation with race 1,2,3,4 of *Phytophthora infestans* at the age of six weeks, seedlings of *S. bulbocastanum* exhibited three types of reaction: immunity, resistance as expressed by nonsporulating lesions of the hypersensitive type, and susceptibility as indicated by large sporulating necrotic lesions. Seedlings resistant to an isolate of race 1,2,3,4 of Canadian origin did not always show the same degree of resistance to a Mexican isolate of the same race and *vice versa*. Seedlings surviving inoculation with race 1,2,3,4 displayed varying degrees of field resistance. Some evidence was obtained that the species is practically field immune in tuber-propagated plants. *S. bulbocastanum* is considered to be a mixture of resistant and susceptible genotypes.

2805 Varis, E.
Eräs perunan makukoe ja sen tulos. **(Flavour test of certain potatoes and its result).**
Koetoiminta ja Käytäntö 1957 : **14** : p. 22.

Potato varieties have been assessed for flavour at the Hankkija plant breeding station and compared with Eigenheimer as standard. This is regarded as the best variety. The others are classified as good or tolerable table potatoes. The best in the former category is Frühnudel.

2806 Sharma, M. K., Isleib, D. R. & Dexter, S. T.
Specific gravity of different zones within potato tubers.
Amer. Potato J. 1958 : **35** : 784–88.

The specific gravity of the following zones in tubers of 19 varieties grown in 1956 and 1957 was determined: (1) the layer corresponding to the so-called cortex, (2) the zone bounded peripherally by the vascular tissue and extending slightly less than half way towards the centre, and (3) an inner zone consisting of the remainder of the tuber. In most cases, (2) was highest and (3) lowest in specific gravity, with little difference between (1) and (2). In general, tubers of varieties high in specific gravity showed wide differences between (3) and the other two zones, whereas varieties with low specific gravity differed little in the values obtained for the three zones. In all the varieties, however, the values for (3) were relatively uniform, varietal differences in specific gravity of the entire tubers being largely due to disparities in the two outer zones.

2807 Gell, P. G. H., Hawkes, J. G. & Wright, S. T. C.
The application of immunological methods to *Solanum* taxonomy.
Proc. Linn. Soc. Lond. 1958 : **169** : p. 239. (Abst.).

It is noted that in studies of the relationships of Mexican wild potatoes and *S. tuberosum*, results obtained from plant immunological methods agree very well with those obtained by cytological and genetical techniques.

2808 **Inventory of tuber-bearing *Solanum* species.**
Bull. Wis. agric. Exp. Sta. 1958 : No. 533 : Pp. 40.

An inventory is given of the species, botanical varieties, interspecific hybrids, and foreign and American varieties of *S. tuberosum* being maintained in the Inter-Regional Potato Collection at the Potato Introduction Station, Sturgeon

Bay, Wis. Chromosome numbers are given in the case of most of the species. The lists of foreign and American varieties of *S. tuberosum* include notes on disease resistance and other important characters. Lists are also given of late-blight differential hosts and of accessions resistant to one or more races of late blight, leaf roll, *Verticillium* wilt, *Empoasca fabae*, *Epitrix cucumeris* and *Myzus persicae*, and resistant or immune to viruses A, X or Y.

2809 Zajceva, N. D.
(Utilizing varieties and species of the potato in breeding).
Kartofel' (Potato), Moskva 1958 : No. 4 : 51–53. [Russian].

A table lists potato varieties studied at the Potato Institute which are said to be valuable in breeding for (1) combined resistance to *Phytophthora* and *Synchytrium*; (2) degeneration and *Synchytrium*; (3) common scab and *Synchytrium*; (4) resistance to Colorado beetle; (5) productiveness; (6) high starch content; (7) earliness; (8) drought resistance and production of two crops in a year; (9) resistance to waterlogging; and (10) increased dry-matter content. The table shows where the varieties were bred and whether they are useful as ♂ or ♀ components in crosses. Among the wild species, *Solanum demissum* and *S. antipoviczii* are mentioned for resistance to *Phytophthora*; *S. macolae* and *S. gibberulosum* to Colorado beetle; *S. acaule* and *S. curtilobum* to low temperatures; and some forms of *S. andigenum* to *Synchytrium* and degeneration.

2810 Bakaeva, G. Z.
(Abundant initial material for breeding).
Kartofel' (Potato), Moskva 1958 : No. 5 : p. 56. [Russian].

Mention is made of recent accessions to the potato collection of the Institute of Plant Industry from South America. They include species resistant to Colorado beetle, nematodes, *Phytophthora*, *Synchytrium* and viruses.

2811 Močalova, T. I.
(Some biological characteristics of the frost-resistant species *Solanum acaule*).
Kartofel' (Potato), Moskva 1958 : No. 4 : 55–56. [Russian].

Physiological and biochemical descriptions are given of 48-chromosome *S. punae*, which withstands — 7° C., flowers profusely but does not form tubers or cross with *S. tuberosum* under Leningrad conditions, and a colchicine-induced polyploid of this having 96 chromosomes, also characterized by frost resistance but crossing readily with *S. tuberosum*. The F_1 plants from the above cross were tolerant of — 5·5° C. at the Leningrad Agricultural Institute and yielded up to 400 g. of closely spaced tubers. Mention is made of hybridization involving diploid *S. punae* and *S. tuberosum* at Sverdlovsk. Only three berries were obtained from pollinations of 6000 flowers and the tuber yield of the hybrids was at first only 150–200 g. per plant. The productiveness was later raised to 400 g. per plant by vegetative-sexual hybridization. The resultant hybrid withstood a temperature of — 4° C.

2812 Rudenko, A. I.
(Methods of combating degeneration caused by climatic conditions).
Kartofel' (Potato), Moskva 1958 : No. 5 : 30–34. [Russian].

The growing of potato varieties resistant to high temperatures is regarded as the principal method of controlling physiological degeneration, which results in development of spindly tubers and reduced tuber yields. Bogarnyj [Rain-fed], Ackersegen, Sibirjak [Siberian], Épron and Ella were the most resistant to degeneration among a large number of varieties tested under irrigation at the Central Asiatic Branch of the Institute of Plant Industry.

2813 Zadina, J.
Rodokmen odrůd bramborů odolných vůči aktinomykózní strupovitosti (*Actinomyces scabies* [Thaxter] Cüsov). [**The pedigree of potato varieties resistant to common scab (*A. scabies* (Thaxter) Cüsov)**].
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba : 1959 : **32** : 173–84.

Information on the pedigree of many varieties resistant to scab is presented. The varieties are divided into four distinct groups: those derived from (1) Jubel, (2) Bismarck, (3) Lech and (4) varieties of unknown parentage or hybrids from crosses between susceptible varieties.

2814 Tomiyama, K.
Cell physiological studies on the resistance of potato plant to *Phytophthora infestans*. IV. On the movements of cytoplasm of the host cell induced by the invasion of *Phytophthora infestans*.
Nihon Shokubutsubyori Gakkai Ho/Ann. phytopath. Soc. Japan 1956 : **21** : 54–62.

In interspecific hybrids showing the hypersensitive reaction to *Ph. infestans*, intensification

in the appearance of protoplasmic strands, migration of the nucleus towards the site of infection and the rhythmic movement of the nucleus round the infected part of the cell were observed in the early stage of penetration by the fungus. Streaming in the strands was stronger in the direction towards the site of infection than in the contrary direction. The acceleration of protoplasmic movement was less marked in infected cells of the susceptible variety *Solanum tuberosum* 'Hokkai 9'. It is presumed that the enhanced protoplasmic movement in the hypersensitive cells is connected with increased energy metabolism.

2815 Tomiyama, K.
(Cytophysiological studies on resistance to late blight. V. On the effect of 2,4-dinitrophenol on the hypersensitive reaction of the cells of resistant potatoes).
Nihon Shokubutsubyori Gakkai Ho/Ann. phytopath. Soc. Japan 1957 : **22** : 75–78. [Japanese].

It has already been reported [cf. XXVIII, 693] that inoculation of *Phytophthora infestans* into a resistant variety is followed by accelerated protoplasmic movement, the appearance of granules in Brownian motion, and finally death of the infected cell. By adding 2,4-dinitrophenol, which inhibits oxidative phosphorylation and protoplasmic movement, death of infected cells was markedly delayed. It is therefore suggested that the death of hypersensitive cells may depend on energy supplied by oxidative phosphorylation.

2816 Yamamoto, M. & Ozoe, M.
(On changes in the pathogenicity of late blight from passage through potato varieties differing in resistance).
Nihon Shokubutsubyori Gakkai Ho/Ann. phytopath. Soc. Japan 1956 : **21** : 63–67. [Japanese].

Experiments involving one or more passages of single-spore isolates of *Phytophthora infestans* through the resistant *Solanum demissum* x *S. tuberosum* hybrid 42044–15 or the susceptible variety Danshaku (= Irish Cobbler) or through various combinations of these varieties are reported to show that virulence depends on the host through which the pathogen has last passed.

2817 Yamamoto, M.
Investigations by means of phase-contrast and polarization microscopes on the penetration of *Phytophthora infestans* into the suscept plants.
Nihon Shokubutsubyori Gakkai Ho/Ann. phytopath. Soc. Japan 1957 : **22** : 148–52.

A comparative study of infected petioles of resistant and susceptible varieties showed that the former were characterized by (1) rapid movement of protoplasmic granules, probably mitochondria, evident under the phase-contrast microscope and (2) birefringence in the cells around the lesions, perceptible with a polarizing microscope.

2818 Detilleux, E.
La culture de la pomme de terre dans la région d'Élisabethville. **(The cultivation of the potato in the region of Élisabethville).**
Bull. INÉAC 1958 : **49** : 323–38.

Data on yield are presented for nine varieties of potato tested in three consecutive seasons. Gineke has given the best yield; this variety and three others were only slightly susceptible to *Phytophthora* and *Alternaria.*

2819 Poos, J. A. J.
Het Phytophthora-probleem bij de aardappelveredeling. **(The *Phytophthora* problem in potato breeding).**
StudKring. PlantVeredel., Wageningen 1958 : 814–18c. (Mimeographed).

This paper has already been summarized from another source [XXVIII, 4405].

2820 Quevedo Díaz, A.
Nuevas razas fisiológicas del *Ph. infestans* en el país, sus pruebas de resistencia en variedades, híbridos y seedlings, y comprobación de la resistencia en condiciones de campo. **(New physiological races of *Ph. infestans* in Peru, tests for resistance in varieties, hybrids and seedlings and confirmation of resistance under field conditions).**
Bol. trimestr. Exp. agropec., Progr. Coop. Exp. Agropec., Lima 1958 : **7** : No. 1 : 10–23.

Most of the work mentioned in this report has been summarized earlier [490]. Additional results include the observations that in tuber inoculation tests, the variety Ruqui colorada [Red Ruqui] had resistant tubers but susceptible foliage and the hybrid 149–1–2–57 (hybrid 15 x Maco ojo blanco [White-eyed Maco]) had both

resistant tubers and resistant leaves, together with commercially valuable characters.

2821 NIEDERHAUSER, J. S.
Eréndira, nueva variedad de papa resistente al tizón tardío. **(Eréndira, a new potato variety resistant to late blight).**
Agric. téc. Méx. 1958 : No. 6 : 2–3, 30.

Developed by the Ministry of Agriculture and Stock of Mexico in cooperation with the US Department of Agriculture, Eréndira is highly resistant to *Phytophthora infestans* and yields well when adequately fertilized. If sown in the rainy season in May or June, it may be harvested after 120 days; it is particularly recommended to the small farmer of the Mesa Central. The tubers are round with rather deep eyes and have white skin and cream-coloured flesh with occasional pink streaks. The parentage is USDA 528–170 x USDA 25891, the former parent being derived from (Chippewa x Katahdin) x Richters Jubel [Richter's Jubilation] and the latter from a cross between two hybrids of *Solanum demissum* x *S. tuberosum.*

2822 TAKASE, N. & TAKAKUWA, M.
(The classification of the Japanese races of late blight and the genes responsible for resistance to late blight according to the international system of designation).
Nihon Shokubutsubyori Gakkai Ho/Ann. phytopath. Soc. Japan 1957 : **22** : 79–82. [Japanese].

[Cf. XXVIII, 1828].

2823 HODGSON, W. A.
Growth of four races of *Phytophthora infestans* (Mont.) de Bary in synthetic media.
Canad. J. Pl. Sci. 1958 : **38** : 145–54.

A study of the differences in nutritional requirements of four races of *Phytophthora infestans* (Mont.) de Bary was made by culturing these on a basal medium (inorganic salts, dextrose, asparagine, thiamin) with various additional compounds. Effects of addition of vitamins were also studied, with positive results only in the case of ascorbic acid. The basal medium supported growth of races 1,2 and 1,2,3. Races 0 and 1 required the addition of peptone.

2824 SERVIN, L. F., GRAHAM, K. & NIEDERHAUSER, J. S.
Las especies silvestres en el mejoramiento de la papa. **(Wild species in potato breeding).**
Agric. téc. Méx. 1958 : No. 6 : 28, 47.

After a brief survey of early work on the use of *Solanum demissum* as a source of resistance to late blight, it is noted that by means of differential selections carrying various combinations of the four resistance factors obtained from *S. demissum,* 16 physiological races have been distinguished. In studies conducted in the Toluca valley, Mexico, which is regarded as particularly favourable to the development of blight, a high degree of partial resistance characterized by few lesions and low sporulation has been shown by *S. demissum, S. iopetalum, S. pinnatisectum, S. cardiophyllum* and *S. bulbocastanum,* the last three species being the most resistant.

2825 PROUDFOOT, K. G.
Physiological races of *Phytophthora infestans* Mont. (de Bary) in Northern Ireland.
Nature, Lond. 1959 : **183** : 626–27.

Seedlings containing R_1, R_2, R_3 and R_4 singly and in all combinations have shown late-blight infection in the field at the Plant Breeding Station, Loughgall, N. Ireland.

2826 **Report of the Late Blight Investigating Committee.**
Amer. Potato J. 1958 : **35** : 758–59.

A brief report is given of the above committee of the Potato Association of America for 1958 [cf. 485]. Investigators in Canada and West Virginia continued to test new introductions for field resistance and major genes. Evidence has been obtained that the fifth and sixth major genes for hypersensitivity are inherited in a similar manner to the other four and that genes corresponding to the latter are present in species other than *Solanum demissum.* Breeding at most stations is concerned with combining as many major genes as possible with a high degree of field resistance. The problem of testing large populations for field resistance has received attention. In West Virginia, growing the plants at controlled low nutrient levels has permitted the selection of resistant individuals. In Canada, inoculation of seedlings in a blight chamber under controlled environmental conditions has led to the establishment of broad groups of field-resistant clones. Selection in the field is complicated when major genes are present, on account of differences in the virulence of races. Workers in Minnesota are exploring the advisability of discarding material with such genes and seeking field resistance dependent on R_0 only. Investigations in West Virginia and Mexico demonstrated that the pathogen is bisexual and self incompatible. Surveys in Canada and elsewhere revealed that race 4 is predominant, in contrast to the situation a few

years ago when race 0 appeared in general to be the most fitted to survive on varieties lacking major genes. Field experiments in Minnesota showed that individual isolates of races differ in aggressiveness and ability to survive in the field.

2827 GALLEGLY, M. E. & EICHENMULLER, J. J.
The spontaneous appearance of the potato race 4 character in cultures of *Phytophthora infestans*.
Amer. Potato J. 1959 : **36** : 45–51.

From the results of single sporangium and single zoospore isolates of ten cultures of different potato physiologic races of *Ph. infestans* it is suggested that the race 4 character may appear in any isolate. The character appeared in isolates of race 0 as race 4, in isolates of race 1 as race 1,4, in isolates of race 3 as race 3,4, in isolates of race 1,2 as race 1,2,4, and in an isolate of race 1,2,3, as race 1,2,3,4. Though the changes are probably due to mutation, the mutant nuclei being carried in the heterocaryotic mycelium along with the original nuclei, it is still possible that the race 4 character entered after zoospore pairing. The high percentage of race 4 noted in race surveys indicates a tendency of the various races of the fungus to mutate to the race 4 character.

2828 TOMIYAMA, K., TAKAKUWA, M., TAKASE, N. & SAKAI, R.
(Physiological studies on the resistance reaction of potatoes infected with late blight. III. Physiological studies on the effect of ethanol treatment on resistance. 1).
Nihon Shokubutsubyori Gakkai Ho/Ann. phytopath. Soc. Japan 1956 : **21** : 17–22. [Japanese].

In an earlier paper [XXVII, 4157], a rise in oxygen intake and in content of protein and polyphenols was noted when *Ph. infestans* was inoculated into a resistant variety. In the present paper, it is reported that these effects are reduced if the tubers are immersed in 10% ethyl alcohol for 10 minutes prior to inoculation.

2829 TOMIYAMA, K., SAKAI, R., TAKASE, N. & TAKAKUWA, M.
(Physiological studies on the resistance reaction of potatoes infected with late blight. IV. Physiological studies on the effect of ethanol treatment on resistance. 2).
Nihon Shokubutsubyori Gakkai Ho/Ann. phytopath. Soc. Japan 1956 : **21** : 153–58. [Japanese].

Ethyl alcohol, which as reported above [2828], inhibits the increase in respiration rate following inoculation of *Ph. infestans* into a resistant variety, also inhibits the increase in respiration rate induced by injury from handling. This inhibition is associated with reduced polyphenol-oxidase activity. While the effects of alcohol treatment persist, the tubers of a resistant variety become more susceptible to infection.

2830 TOMIYAMA, K.
(Cytophysiological studies on resistance to late blight. VII. A comparison of hyphal length of the pathogen in living cells of petioles of resistant and susceptible potato varieties).
Nihon Shokubutsubyori Gakkai Ho/Ann. phytopath. Soc. Japan 1957 : **22** : 129–33. [Japanese].

Micrometric determinations of intracellular hyphal length in cut petioles of the varieties Irish Cobbler (*r*), Hokkai 10 (R_1), Hokkai 17 and 48005–46 (R_4) and 41089–8 (R_1R_4) inoculated with races 0; 1; 4; and 1,4 are reported. Some marked differences in the hyphal lengths of the different pathogen races after inoculation were noted but differences due to variety of the host were not significant.

2831 TOMIYAMA, K.
The influence of a pre-infectional heat treatment on the resistance of potato plant to *Phytophthora infestans*. (Cytophysiological studies on resistance of potato plants to *Phytophthora infestans*. VIII).
Nihon Shokubutsubyori Gakkai Ho/Ann. phytopath. Soc. Japan 1957 : **22** : 237–42.

Resistance to infection and respiratory rate were markedly reduced by subjecting tubers of strain 41089–8 (R_1R_4) to 45–53·5° C. for five minutes before inoculation. Race 0 of *Ph. infestans* was used. These observations support the view that the hypersensitive reaction of this variety is associated with the metabolic activity of the tissues.

2832 KRÁLOVÁ, H.
Příspěvek ke spongosporové strupovitosti brambor. **(A contribution to the study of powdery scab of potatoes).**
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba : 1959 : **32** : 163–72.

Krasava, Kotnov, Kardinál [Cardinal], Blaník and Rapid were more resistant to *Spongospora* than other Czechoslovak varieties tested at Havlíčkův Brod. Fair resistance was also shown

by the introduced varieties Flämingsstärke, Kolobrzewskie, Grohn, Aal [Eel] and Tiger.

2833 Baruah, H. K., Konger, G. & Chowdhury, B.
On susceptibility of potato to infection by *Fusarium radicicola* Woll.
Sci. & Cult. 1958 : **24** : 99–100.

In investigations at the Departments of Botany and Physics, Gauhati University, Assam, Up to Date showed no infection after inoculation with *F. radicicola*, whereas Arran Consul and Local had respectively 100% and 20%. The periderm was of significance in determining the reaction of the tubers, Up to Date exhibiting greater suberization than Arran Consul. The iron content of the periderm of Arran Consul, Local and Up to Date was respectively 1·51, 1·31 and 0·52%. By immersing tubers of Up to Date in 0·1–1·0% ferric chloride for 1–48 hr. and then inoculating them, a very high degree of infection was obtained, whereas in tubers immersed in water no infection was observed. Possibly the pathogen produces, in the soil or during infection, a toxic substance which affects the iron metabolism of the host and has a greater effect in plants possessing a high iron content.

2834 Rothacker, D.
Beiträge zur Resistenzzüchtung gegen den Kartoffelnematoden (*Heterodera rostochiensis* Wollenweber). III. Untersuchungen über den Einfluss unterschiedlicher Kreuzungspartner auf die Ausbildung verschiedener Knolleneigenschaften bei Kartoffelkreuzungen, zugleich ein Beitrag zur Züchtungsmethodik. [**Contributions to breeding for resistance to potato eelworm (*H. rostochiensis* Wollenweber). III. Investigations on the influence of different parents on the development of various tuber characters in potato crossing, also a contribution to breeding methods**].
Züchter 1958 : **28** : 133–43.

Progeny from crosses between *Solanum tuberosum* ssp. *andigenum* and six cultivated varieties were studied; about 75 per cent of the F_1 seedlings had small tubers and many produced a high number of tubers per plant. Half of the seedlings had ochre-coloured skins and 85 per cent had yellow flesh. Crosses involving Apta, Cornelia and Frühmölle were especially good as regards tuber size, and with respect to tuber shape, Aquila, Oberarnbacher Frühe [Oberarnbach Early] and Vera crosses were outstanding.
The Apta and Cornelia combinations gave many plants with red or blue coloration of the skin but the flesh was a good yellow colour; types with deep yellow flesh were more frequent in these crosses than in the others. Crossing the same cultivated variety with several *S. tuberosum* ssp. *andigenum* clones showed that these latter differ in their influence on the inheritance of tuber characters; a further report on these findings is to be published. Future plans for the breeding of nematode-resistant potatoes at Gross-Lüsewitz are outlined and discussed. The long term aim is to breed resistant varieties which will equal or surpass current first-class varieties in all characters of importance. It is also hoped to produce resistant races which are suited to normal cultivation and which may be used for clearing heavily contaminated fields of eelworms. The breeding scheme described involves repeated back crossing of *S. tuberosum* ssp. *andigenum* x *S. tuberosum* ssp. *tuberosum* hybrids to cultivated varieties, with frequent testing to determine how the populations are segregating for nematode resistance.
S. vernei is also being used in the breeding programme; some difficulties are encountered here for the probable polygenic mode of inheritance of nematode resistance has not yet been fully elucidated. Normal *S. vernei* has 24 chromosomes and crossing with cultivated varieties gave a low seed set and partially sterile hybrids. Better results were obtained when tetraploid *S. vernei* clones were crossed with cultivated varieties; some of the progeny were resistant, some susceptible and others were intermediate in this respect. Also differences were noted between the various *S. vernei* parent clones as regards the segregation for resistance in their hybrid progeny. Crosses between *S. demissum* and 2*n* *S. vernei* gave some F_1 hybrids which were vigorous, produced many flowers and were fertile; others were abnormal in various respects. Hybridization of the best hybrids with cultivated varieties was successfully effected. After every cross with *S. vernei* it is necessary to self the hybrid population and select those types with most genes for resistance before further crosses are made between the hybrids and cultivated types.
Crossing of *S. vernei* with primitive cultivated species such as *S. phureja* indicated that these latter forms may also be useful in breeding for nematode resistance; the interspecific hybrids need to be converted into tetraploids and then crossed with cultivated varieties. [Cf. XXVIII, 1832].

2835 COSTA, C. A. DA
O escaravelho da batateira (*Leptinotarsa decemlineata* Say). [**The Colorado beetle (*L. decemlineata* Say)**].
Bol. Jta. nac. Frutas, Lisboa 1956 : **16** : 40–168.

Brief allusion is made to the use of wild *Solanum* species in breeding for resistance to the above pest.

QUAK, F., DIJKSTRA, J., BEEMSTER, A. B. R. & VAN DER WANT, J. P. H. (Editors).
Proceedings of the third conference on potato virus diseases at Lisse-Wageningen, 24-28 June, 1957.
Wageningen 1958 : Pp. 282.

2836 *van Slogteren, D. H. M. A potato virus identified with potato virus M and its relationship with potato virus S.* (*pp. 20–36*).

This account of studies on virus M carried out in Holland includes notes on the reactions of several potato varieties to different strains of virus M.

2837 *Loughnane, J. B. A necrosis of potato tubers caused by the paracrinkle virus.* (*pp. 179–83*).

Twenty-nine potato varieties were grafted with scions of King Edward potato containing paracrinkle virus at University College, Dublin, Ireland; 17 of the varieties developed necrosis in the tubers. In general, the tubers remained free of necrosis in varieties showing no foliar symptoms.

2838 *Lihnell, D. Investigations on spraing.* (*pp. 184–88*).

In Sweden more than 100 potato varieties have been examined for resistance to spraing. There is some evidence that spraing is caused by a virus related to, but not identical with, the potato stem-mottle virus.

2839 *Köhler, E. Das Verhalten des X-virus in damit geimpften Blättern unterschiedlichen Resistenztyps.* (*The behaviour of virus X in inoculated leaves of different types of resistance*). (*pp. 189–98*).

In investigations conducted at the Federal Biological Institute, Braunschweig, Germany, no multiplication of potato virus X was found in inoculated leaves of the USDA seedling 41956. Also inactivation of virus particles was found to be much more rapid in 41956 than in various susceptible plants, including the potato variety A6, and in the nonsusceptible species *Phaseolus vulgaris*. It is suggested that the immunity of 41956 may result from premature inactivation of virus particles in the ectodesms, which are strands of cytoplasm passing through the outer walls of the epidermis. This inactivation system may be the same as that responsible for the localized resistance of other varieties such as Epicure [cf. XXIII, 473].

2840 *Cockerham, G. Experimental breeding in relation to virus resistance.* (*pp. 199–203*).

At the Scottish Plant Breeding Station, Roslin, it was shown that the reaction of *Solanum acaule* to potato virus X is controlled by three allelomorphic genes which in descending order of dominance determine immune, necrotic and tolerant responses; the genes are designated *Xi*, *Xn* and *x* respectively. In *S. demissum* a series of alleles was found to control reactions to viruses Y and A. These genes, designated N^y, N^a and *n*, determine respectively combined necrotic reaction to viruses Y and A, necrotic reaction to virus A only and anecrotic tolerant reactions to both viruses; the order of dominance is $N^y > N^a > n$. There is some evidence that viruses Y and A are related.

2841 *Ross, H. Inheritance of extreme resistance to virus Y in* Solanum stoloniferum *and its hybrids with* Solanum tuberosum. (*pp. 204–11*).

This report comes from the Max Planck Institute for Plant Breeding, Köln-Vogelsang, Germany. It was found that resistance to virus Y in *S. stoloniferum* is governed by a single gene inherited in a disomic manner. Three alleles have been found at the locus concerned; in descending order of dominance, these are *Ry* for extreme resistance, *ryn* for hypersensitivity and *ry* for susceptibility. Variation in the hypersensitive reaction seemed to be determined by different polygenes.

Some varieties of *S. stoloniferum* were found to carry another gene controlling resistance to virus A. The same three types of reaction occurred with virus A as with virus Y, indicating the existence of another series of alleles. *Ra*, the gene for resistance to virus A, is closely linked to *Ry*.

With the aim of incorporating the two resistance genes into the genome of *S. tuberosum*, varieties of *S. stoloniferum* resistant to viruses A and Y were crossed and back crossed over several generations to *S. tuberosum* varieties. Polygenes from *S. tuberosum* affected the reaction determined by *Ry* in the hybrids and in some cases, necroses formed. The polygenes did not convert resistance or hypersensitivity to susceptibility. Some of the highly resistant hybrids gave satisfactory yields whilst others did not. They

inherit resistance to *Phytophthora* from *S. stoloniferum* and their resistance to leaf roll can be improved by crossing with *S. demissum*. Resistance to virus X is introduced by crossing with *S. acaule*.
Some remarks on the cytogenetics of hybrids between *S. stoloniferum* and *S. tuberosum* are included in this paper.

2842 *Beemster, A. B. R. Some aspects of mature plant resistance to viruses in the potato. (pp. 212–17).*
Resistance to virus X was found in mature plants of the varieties Bintje, Eigenheimer and Voran; Bevelander did not show mature-plant resistance. Resistance to leaf-roll virus has also been found in mature plants of Bintje and Eigenheimer.

2843 Schick, G.
(The problems of potato production and methods of securing nursery material).
Kartofel' (Potato), Moskva 1958 : No. 4 : 37–41. [Russian].
Argo, Mira, Capella and Nova were superior in resistance to viruses to all other varieties tested at Gross Lüsewitz. All four varieties were bred at Malchow, Mecklenburg-Schwerin.

2844 Bode, O., Scheibe, K. & Borchardt, G.
Resistenz von Kartoffelsorten gegenüber dem Y-virus. **(The resistance of potato varieties towards the Y virus).**
Kartoffelbau 1958 : **9** : 231–33, 236.
Data are provided on the resistance of about 80 varieties tested in Braunschweig and Hannover with the tobacco brown vein virus.

2845 Arenz, B. & Hunnius, W.
Untersuchungen über die Sortenresistenz gegen verschiedene Y-Virus-Stammgruppen. **(Investigations on varietal resistance to different groups of virus Y).**
Züchter 1958 : **28** : 360–66.
During 1957, 36 potato varieties were tested at Weihenstephan with the so-called old and new races of virus Y; the new races differ from the old in causing a necrotic reaction on tobacco. Observations were made on the primary symptoms produced on the foliage and also the numbers of infected tubers were noted, the tests being carried out in greenhouses using aphid vectors.
The old races caused necroses looking like splashes of ink on the leaves of all varieties except Ute. Nine varieties showed no primary symptoms after infection with the new races but in some cases net-like necroses on the leaf veins were observed.
The varieties were classified into four groups in respect of their resistance to each virus group; all varieties did not show the same degree of resistance to both groups. Capella, Delos, Lori and Eva showed high resistance to both old and new races.
Infection with the new races was more often latent than with the old races. Moreover in some varieties both primary and secondary infections were latent and in others, primary and secondary infection differed in this respect. Also the effect of early harvesting on the virus infection was studied.

2846 Aura, K.
Suomessa viljellyn perunan virustautisuudesta. **(On the virus diseases affecting potato cultivation in Finland).**
Maataloust. Aikakausk. 1957 : **29** : 103–10.
The occurrence and distribution of potato viruses S and X in Finland are examined. Variety Eigenheimer, which is most commonly grown, is heavily infected by virus X; Rosafolia, also commonly grown, is also fairly heavily infected. Virus S is most prevalent on Jaakko. The newer varieties Aquila and Siikli (= Sieglinde) are only slightly infected. The local variety Hettula is heavily infected by S and X viruses.

2847 Aura, K.
Perunan viroosien yleisyys ja levinneisyys Suomessa. **(The occurrence and distribution of potato virus diseases in Finland).**
Koetoiminta ja Käytäntö 1957 : **14** : p. 27.
Serological tests carried out in 1955–56 show that the two most commonly cultivated potato varieties, Eigenheimer and Rosafolia, show a high incidence of S and X virus diseases. Data on infection are given for a large number of varieties. Ulster Chieftain only showed no infection; in Aquila and Sieglinde it was lower than in most.

2848 Varis, E.
Perunalajikkeiden virustautisuudesta. **(Virus disease of potato varieties).**
Koetominta ja Käytäntö 1958 : **15** : p. 19.
Data for X-virus disease in a number of potato varieties collected at Hankkija in the years 1953–57 show heavy infection of Upto and Olympia and greatest resistance in Tammisto aikainen [Early Tammisto] and Aquila. The former however is a carrier of Y-virus disease.

2849 Easton, G. D., Larson, R. H. & Hougas, R. W.
Immunity to virus Y in the genus Solanum.
Res. Bull. Wis. agric. Exp. Sta. 1958 : No. 205 : Pp. 32.

Of 16 isolates of potato virus Y from Brazil, Ecuador, the Netherlands, Ireland, Germany and the USA, four were considered to be severe while the other 12 were medium or mild. The behaviour of the isolates differed on *Physalis floridana*, tobacco, pepper, *Datura metel*, *Solanum nigrum* and tester potato varieties.

Virus-Y isolates rated as medium or severe on potato were used to test 13 *Solanum* species and nine interspecific hybrids for immunity. Plants that were immune to mechnical inoculation were further tested, using grafts and aphids (*Myzus persicae*) to make certain that immunity would be expressed to different types of inoculation. Clonal lines of eight *Solanum* species and six clonal lines of *S. stoloniferum* were susceptible. Seven clonal tuber lines of *S. stoloniferum*, a clonal tuber line of *S. antipoviczii* and thirteen clonal tuber lines of *Solanum* interspecific hybrids were immune. Only six out of the 19 lines that contained the virus-Y immune *S. stoloniferum* as one parent were found to be immune.

Plant populations from selfed seed of two lines of *S. antipoviczii*, *S. tlaxcalense* and *S. stoloniferum* were immune. In another line of *S. antipoviczii*, segregation for immunity and susceptibility occurred in respect of mechanical inoculation, but it was immune to graft and aphid inoculations.

The possibilities of breeding virus-Y immune potatoes are discussed.

2850 Anderson, R. D.
Purple top wilt of potatoes.
J. Dep. Agric. Vict. 1959 : **57** : 128–34.

According to field evidence purple top wilt of potatoes, which is caused by tomato big bud virus and is widespread in south-eastern Australia, is most common on Exton and Sebago. It has also been recorded on Sequoia, Crana and Walanga and on one hybrid seedling.

2851 Tejhman-Vil'moš
(The growing of seed potatoes and combating diseases in Hungary).
Kartofel' (Potato), Moskva 1958 : No. 5 : 26–30. [Russian].

This article discusses propagation of healthy material and resistance breeding, the aim being varieties resistant to degeneration, leaf roll and other virus diseases. The methods employed are (1) hybridization between introduced varieties resistant to degeneration and Hungarian varieties adapted to the local environment and (2) development of selfed lines from selected clones of many varieties and seedlings.

2852 Rodigin, M. N.
(Studying potato diseases in China).
Kartofel' (Potato), Moskva 1958 : No. 4 : 62–63. [Russian].

Mention is made of some Chinese varieties resistant to diseases, in particular Wu-sai-chu-hua-pai, Li-wai-huang and Wu-ta-pai which are resistant to *Phytophthora* under the climatic conditions of Shansi. Hun-pi [Red Skin], a local variety from the province of Anhwei, is mentioned for its earliness, high yield and resistance to degeneration, mosaic and other virus diseases.

2853 Hedou, J.
La sérologie au service du sélectionneur. **(Serology in the service of the breeder).**
Pomme d. Terre franç. 1958 : **21** : No. 231: 4–5.

A brief account is presented of how serological methods are used to identify viruses infecting potatoes; serology is useful in selecting healthy breeding lines.

2854 Olan, V. R.
Description of the different varieties of sweet potatoes.
Philipp. J. Agric. 1955 : **20** : 159–73.

The leaves, stem, flowering habit and tuber characters (cooked and uncooked) of varieties of sweet potato from different parts of the Philippines are described. The approximate time taken to mature and production per hectare are also given. Bayambang, Bigsi and Karinkit are the highest yielders.

2855 Kuwada, H. & Yamamoto, K.
(The mode of existence of carotenoid pigments in the sweet potato and the content of carotene).
Kagawa Nogyo Semmongakko Kenkyu Hokoku/Tech. Bull. Kagawa Agric. Coll. 1956 : **8** : No. 1 : 15–18. [Japanese].

Marked differences in the content and distribution of crystalline and noncrystalline carotenoids in the five varieties investigated are reported. The highest content of carotene was in the variety Hayato [Sweet potato from Satsuma], the quantity rising steeply during development.

2856 Hsia, W. & Chien, C.-K.
(Studies on the promotion of flowering in nonflowering sweet-potato varieties).
Chung-hua Nung-hsueh Hui Pao/J. agric. Ass. China 1956 : **14** : 15–24. [Chinese].
Nine varieties that normally fail to flower did so after grafting on the profusely flowering variety Mei-kuo Huang-pi [American Yellow Skin] and to a much lesser extent after girdling. Varietal differences in response to these treatments and in duration of induced flowering are noted.

2857 Suzuki, N.
(Studies on *Helicobasidium mompa.* VI. Histochemical studies of infected regions ; chemical changes in infected tissues).
Nogyo Gijutsu Kenkyusho Hokoku/ Bull. Nat. Inst. agric. Sci. : Ser. C : 1957 : No. 8 : 69–130. [Japanese].
This detailed study of chemical changes in sweet-potato tubers following infection with *H. mompa* is principally concerned with the induced formation of lignin, cork, polyphenols, ascorbic acid, glutathione and the sesquiterpene ipomeamarone. Varietal differences in resistance to the pathogen are recorded. It is noted that in resistant varieties the concentration of ipomeamarone is high in the necrotic tissue and drops sharply when passing away from it, while in susceptible varieties the concentration of this substance is lower in the necrotic zone but declines only gradually with distance.

2858 Suzuki, N. & Toyoda, S.
(Studies on *Helicobasidium mompa.* VII. Histochemical studies of infected regions; respiratory stimulation, energy metabolism, tissue browning and resistance).
Nogyo Gijutsu Kenkyusho Hokoku/ Bull. Nat. Inst. agric. Sci. : Ser. C : 1957 : No. 8 : 131–70. [Japanese].
A comparative study of sweet potatoes, resistant and susceptible to the above pathogen, has shown that the rate of respiration in infected tissues of resistant varieties increases 1·5–2 times in contrast to an increase of 3–10 times in susceptible forms. However, oxidative phosphorylation occurs at a low rate in infected susceptible varieties in comparison with the high rate in resistant material. In resistant. varieties, a marked increase in chlorogenic acid and ipomeamarone occurs in the lesions. The latter substance is toxic to the host and rather less so to the pathogen. Its high local concentration in resistant varieties results in the death of the host cells and also appears to inhibit fungal growth. In susceptible varieties, the lower concentration of ipomeamarone does not inhibit fungal growth but seems to lower host resistance by obstructing oxidative phosphorylation.

2859 Kantzes, J. G. & Cox, C. E.
Nutrition, pathogenicity, and control of *Monilochaetes infuscans* Ell. & Halst. ex Harter, the incitant of scurf of sweet potatoes.
Bull. Md. agric. Exp. Sta. 1958 : No. A–95 : Pp. 28.
The investigations included laboratory and greenhouse tests of the reactions of varieties and seedlings to 13 isolates of *M. infuscans* and to a nonpigmented mutant of one of the isolates. A field study of the responses of varieties and seedlings to a mixture of three cultures isolated from sweet potatoes growing in the Salisbury area of Maryland was also carried out. None of the entries showed immunity, although all three types of test revealed differences in susceptibility. The majority of the varieties and seedlings exhibited about the same degree of susceptibility in the laboratory, greenhouse and field. Some varieties reported as resistant under field conditions were, however, susceptible in all three types of test, in each of which the conditions were very favourable for infection. All isolates were pathogenic, with the exception of the nonpigmented mutant. Differences in virulence were found among the isolates. It is suggested that the following laboratory procedure offers a rapid, accurate method of recognizing disparities in susceptibility among varieties and breeding lines prior to testing in field plots. After inoculation, the plants are kept in moist chambers for 30 days at 72°–75° F. Infection is recorded as the largest diameter of the lesion which develops around the pathogen-saturated filter-paper disc used as inoculum.

FIBRES

2860 Miller, P. A., Williams, J. C. & Robinson, H. F.
Variety x environment interactions in cotton variety tests and their implications on testing methods.
Agron. J. 1959 : **51** : 132–34.
Fifteen varieties were evaluated at the same nine centres in North Carolina for a three-year period. Data were obtained on lint yield, lint

percentage, weight per boll, fibre length (fibrograph, upper half mean), fibre strength (Pressley breaker) and fibre fineness (micronaire). With respect to yield, variety x location and variety x year interactions were not significant. The second-order interaction of varieties x locations x years was however highly significant. These results indicated that the varieties responded differently when grown in different environments but that there were no consistent effects of location or year on differential varietal behaviour. Data from the individual tests suggested that pattern of rainfall distribution and insect infestation were the chief factors determining differential varietal response. Characters other than lint yield, with the exception of fibre fineness, also showed a second-order interaction of greater magnitude than either of the first-order interactions. In all cases, however, the interaction components were very small relative to the variety variance component and may thus be considered as negligible. The lack of sizable variety x location interactions for the state as a whole indicates that little, if any, advantage would be gained by attempting to divide the state into subareas for the purposes of breeding and testing. Breeding for specific environments may however be feasible in those cases in which the most important environmental factors are to some extent under control as the result of cultural practices and therefore predictable at planting time.

2861 Dick, J. B. & Owings, A. D.
Cotton variety studies in the Mississippi Delta for the 3-year period, 1955-1957.
Circ. Miss. agric. Exp. Sta. 1958 : No. 213 : Pp. 8.

The results of trials of commercial varieties at four centres in the Yazoo - Mississippi Delta are summarized.

2862 Iyengar, N. K. & Ramachandran, K.
Interrelation of three mutant genes in *G. arboreum*.
Sci. & Cult. 1958 : **23** : 602–04.

Investigations were carried out on the relationships of the genes *m*, *pte* and R_2^{os}, respectively determining the "meristic variant" [cf. XXI, 2828], the "pistillate" mutant [XXI, 1993], and mutant CST–3 [XXI, 1982 and XXVI, 2630]. The meristic mutant carries R_2^{AS} for anthocyanin pigmentation. In the F_2 of the meristic x pistillate mutants, plants having (1) normal number and structure of floral parts, (2) increased number and normal structure of floral parts, and (3) normal number of floral parts and the characters of the pistillate mutant segregated in a ratio of 9 : 3 : 4. This result is explained on the basis of epistasy of *pte* over *m*. In the cross of the meristic mutant x CST–3, *m* and R_2^{os} were inherited independently, a normal dihybrid ratio being obtained in the F_2.

2863 Chow [Chou], K.-Y.
(Segregation of characters in an intergeneric hybrid between *Gossypium* and *Hibiscus*).
Fu-chien Nung-hsueh-yuan Hsueh-pao/ Fukien agric. J. 1957 : No. 6 : 1–20. [Chinese].

F_1 and F_2 generations have been reared after pollinating a vegetative hybrid between *G. nanking* and *G. hirsutum* with *H. rosa-sinensis* [cf. XXVII, 4184]. Very wide variation in all plant characters, with the appearance of characteristics of other *Gossypium* species, is reported in the F_2. In particular lint lengths of 0–48 mm. are cited.

2864 Bhat, N. R. & Desai, K. B.
Genetic studies on the 'yellow-green' and 'green-yellow' mutants in *Gossypium herbaceum*.
Indian J. Genet. 1958 : **18** : 54–56.

A single recessive mutant, designated yellow green, was discovered at the Agricultural Research Station, Surat, Bombay State. It is characterized by pale-yellow coloration until the age of about 3 months, when the leaves begin to turn green but develop yellow blotches which subsequently become white. The mutant was inherited independently of three other chlorophyll mutants in *G. herbaceum*: pale green and yellow seedling lethal, both described by Patel *et al.* [XIX, 1098], and a green-yellow mutant from Broach Agricultural Research Station.

2865 Moosberg, C. A. & Waddle, B. A.
Rex cotton . . . a progress report.
Arkans. Fm. Res. 1958 : **7** : No. 6 : p. 9.

Additional information is given on the above variety [XXVIII, 1862] with reference to its seedling vigour, earliness, yield on different soils, quality and production costs.

2866 Roganovič [Roganovič], B.
(Cotton growing in the Federal People's Republic of Jugoslavia).
Hlopkovodstvo (Cotton Growing) 1958 : No. 5 : 49–54. [Russian].

Mention is made of new Jugoslav varieties bred especially for cultivation in different climatic regions. Makedonka [Macedonian] and 7, which are adapted to south Macedonia, have a lint length of 27·5–28 mm., ginning percentage of

35–36% and yield up to 17 c. raw cotton per ha. Varieties 23 and 182 are fairly early and productive in north Macedonia and have a lint length of 23–26 mm. and ginning percentage of 31–34%. The early varieties Timok 8/1 and Novi Sad 4772 grow well in the new areas under cotton in Serbia, Vojvodina and Hercegovina. They are high yielding and resistant to diseases and have lint length of 22–27 mm. and ginning percentage of the order of 32–34%.

2867 McGregor, S. E.
Cotton-flower visitation and pollen distribution by honey bees.
Science 1959 : **129** : 97–98.

Investigations on the above were carried out in view of the possible use of insects in the transfer of pollen to parents with chemically-induced male sterility in the production of hybrid cotton. Using Pima S–1, a variety in which the stigma may extend as much as 20 mm. above the uppermost anther, counts of the following were made at weekly intervals between 10·00 and 12·00 hr. during 1955 and 1956: (1) number of flowers per 100 ft. of row in plots comprising the isolated test field, (2) number of bees seen in each plot as the observer walked along the row, and (3) number of stigmas which appeared to be well-coated with pollen above the anthers. In both years a high correlation was found between number of honey bees per 100 flowers and number of well-coated stigmas per 100 flowers. Increase in the number of bees to more than about 10 per 100 flowers did not increase their effectiveness as measured by (3).

2868 Bereznjakovskaja, A.
(Hybridization and directed training of cotton).
Hlopkovodstvo (Cotton Growing) 1958 : No. 5 : 36–40. [Russian].

Early-ripening cotton varieties with a compact habit such as KK351, KK602, KK1083, KK1407 and KK1543 were fertilized with a pollen mixture of 108F + S450–555 + 137F + S460 + Triumf Navrockogo [Navrockij's Triumph] + *Gossypium arboreum*, the last mentioned being resistant to diseases. The other varieties which supplied the pollen are characterized by high yield, large boll, good technological properties of the fibre and midseason or late maturation. The hybrids were subjected to directed training, consisting of vernalization treatments at temperatures lower than commonly used or increased dressing with P. The training of the hybrids was carried on in the F_1, F_2, F_3 and F_4, single-plant selections for desired characters being made each year. The results comprise A16, A185, A187, A214 and a number of other new varieties combining earliness and compact habit with large bolls and improved yield. Most are *mélange* types and some are resistant to wilt. A150 sheds most of its leaves before harvesting. Mention is made of new improved forms selected from 108F, S460, S1470 and other varieties which had been subjected to environmental training without hybridization.

2869 Rhyne, C. L., Smith, F. H. & Miller, P. A.
The glandless leaf phenotype in cotton and its association with low gossypol content in the seed.
Agron. J. 1959 : **51** : 148–52.

A selection of Hopi Moencopi (*Gossypium hirsutum*), having a low gossypol content and leaves at the flowering nodes virtually free from glands, was chosen as a parent in investigations at the North Carolina State College. Segregating populations derived from a cross between this parent and Acala G were selected for reduced number and size of glands in leaves at the flowering nodes. Acala G has leaves normal as regards gland number and size and a gossypol content similar to that of commercial varieties. Progenies pure-breeding for glandless leaves and with a gossypol content of 0·10–0·50%, improved colour of the oil and high nutritive value, were obtained. The use of a gland-leaf index to develop lines with a gossypol content of less than 0·55% and to reduce the number of chemical analyses is suggested. Data on the glandless-leaf lines indicated that gossypol content was influenced very little by environmental conditions. An association was detected between low gossypol content and naked seed. This and other associations were partly responsible for the inferior yielding ability of low-gossypol lines at an early stage of breeding. Glandless leaves depend upon qualitative recessive genes. The interrelationships between genes for glandless leaves and the quantitative genes determining gossypol production require analysis.

2870 Šlejher, A.
(Experiments on the sorting of cotton seed).
Hlopkovodstvo (Cotton Growing) 1958 : No. 5 : 30–33. [Russian].

The size and specific weight of the seed of cotton varieties were studied in relation to seed viability and raw-cotton yield at Taškent, varietal differences being noted.

2871 Lalaev, G.
(The efficacy of selection among cotton plants from natural intervarietal cross pollination).
Hlopkovodstvo (Cotton Growing) 1958 : No. 5 : 41–42. [Russian].
An account of single-plant selection among natural hybrids of A354 and 1298, whose pollen parents have not been identified, A352–1 x A354 and S450–555 x A15 in Armenia, together with descriptions of the new varieties thus obtained, is presented. The results comprise A19, A469, A539, and A574, all of which are characterized by larger bolls, greater earliness than their maternal parent and improved technological properties of the fibre.

2872 Demol, J. & Niclaes, J.
Contribution à l'étude des variations de la résistance de la fibre de coton en relation avec les facteurs du climat. **(A contribution to the study of variations in the resistance of cotton fibre in relation to climatic factors).**
Bull. agric. Congo belge 1958 : **49** : 1291–1300.
Determinations of fibre strength were made for eight varieties grown at five stations in the northern cotton belt of the Belgian Congo. During each of three seasons, the varieties were classified in the same order according to their fibre strength, thus showing that they were uniformly influenced by the climatic conditions. Data are presented on the strength of the fibre of eight varieties at five stations in the Belgian Congo.

2873 Prokhanov, Y.
What is *Gossypium barbadense* Linnaeus ?
Taxon, Utrecht 1959 : **8** : 41–46.
The epithet *G. barbadense* L. is believed to have been incorrectly applied in recent years. The plant grown by Linnaeus at Uppsala and given this name is believed to have been a form of *G. arboreum* L. differing from the type in having leaves with three broad lobes. Linnaeus cited Plukenet's *Gossypium frutescens, annuum, folio trilobato Barbadense* as a synonym of his *G. barbadense*. This is thought to have been an error; moreover Plukenet's epithet is regarded as a *nomen confusum* since it represents a conflation of *G. herbaceum* L., *G. hirsutum* L. and the kidney cotton of Brazil. If *G. barbadense* L. is reduced to a variety of *G. arboreum* L., the correct epithet for the South American taxon currently known as *G. barbadense* L. becomes *G. peruvianum* Cav.

2874 Saunders, J. H.
The wild species of *Gossypium*.
Emp. Cott. Gr. Rev. 1959 : **36** : 14–15.
The first of a series of drawings and notes on the botanical features and other characteristics of the wild species of *Gossypium*, this instalment deals with *G. anomalum* and *G. triphyllum* and includes a note on various aspects of the B genome.

2875 Pressley, E. H.
Cotton breeders seek wilt-resistant strains.
Progr. agric. Ariz. 1958 : **10** : No. 1 : p. 7.
Strains of 44WR have been selected for a higher degree of resistance to *Verticillium* wilt and storm damage in Arizona. The strains have compared well in spinning qualities with commercial 44WR. In a test on wilt-infested soil in 1957, most of the strains surpassed commercial 44WR in yield and six were more tolerant of wilt.

2876 Shen, C.-I.
(Preliminary studies on the resistance of cotton varieties to *Verticillium* wilt).
Pei-ching Nung-yeh Ta-hsueh Hsueh-pao/Sci. Rep. Peking agric. Univ. 1957 : **3** : 157–65. [Chinese].
Eight Chinese and thirteen Soviet varieties were tested at six locations in northern China for resistance to the above pathogen. Soviet Sea Island varieties tended to be most resistant; these were all late forms. Some evidence of biotypic differentiation of the pathogen was obtained.

2877 Hollis, J. P.
Relations between root knot and fusarium vascular discoloration in cotton varieties.
Phytopathology 1958 : **48** : 661–65.
Data are provided on the root knot caused by *Meloidogyne incognita* and the vascular discoloration caused by *F. oxysporum* f. *vasinfectum* in four cotton varieties studied in Louisiana. The correlation between the two diseases is shown for each variety and also the root knot - vascular discoloration ratio.

2878 Wessling, W. H.
Genotypic reactions to boll weevil attack in Upland cotton.
Diss. Abstr. 1958 : **19** : LC Card Mic 58–2382 : p. 26. (Abst.).
Part of these investigations on resistance to

boll weevil (*Anthonomus grandis*) have been described elsewhere [cf. XXIX, 515]. The present report also provides information on the results of similar tests of the reactions of 14 strains of Upland cotton. The strains tested combined any two of the following mutant genes or their normal alleles: H_1 for hairiness on the lower surface of the leaf and on the stem and petioles; H_2 for a dense, short cover of hairs on the entire plant; *sb* for absence of glands on the stem, petioles, hypocotyl and bolls; and R_1, responsible for red coloration of the whole plant. Strains carrying alleles corresponding to the mutant ones were included in order to exclude any differences in resistance arising through disparities in genetical background. Strains combining H_1, R_1 and their opposite alleles were not included in the test for technical reasons. All the mutant strains showed varying degrees of resistance, those combining H_1 and H_2 possessing the highest degree, and those with *sb* and H_2, and *sb* and H_1 ranking second and third, respectively. Strains carrying R_1 in combination with *sb* or H_2 were tested in a separate experiment and displayed a relatively high degree of resistance. Strains containing the opposite alleles to the mutant genes did not differ significantly from one another. Strains carrying the same mutant genes but differing in genetical background were also found not to differ significantly from one another. Values of the combined main effects and interactions for H_1, H_2 and *sb* were calculated and tested. Under the experimental conditions, H_2 had the highest main effect and interaction, while H_1 had less effect and interaction and *sb* was without significance in these two respects. The possibility that *sb* may confer some degree of resistance under conditions of natural infestation is not however excluded, since the tests were extremely severe and not well suited to discerning the significance of this gene, the chief effect of which may be expressed in lack of attraction of the plants for the pest.

2879 Garrido, T. G.
Progress report on kapok breeding.
Philipp. J. Agric. 1955 : **20** : 233–67.

Javanese kapok crossed readily with the Philippine native form and the F_1 progenies had high pollen fertility. The flowers of the most promising F_1 tree were selfed. In the resulting F_2 generation, spinelessness, medium spines and conspicuous spines were inherited in the ratio of 49·98 : 45·47 : 4·55, which does not fit a normal Mendelian ratio, probably because of the heterozygous condition of the parents used. Normal segregation in an almost 3 : 1 ratio occurred with the deciduous *v.* evergreen character. The length, diameter, weight and number of pods per cluster, weight and number of seeds, and yield of pods and floss of these F_2 trees were compared with the Javanese and Philippine forms over a five-year period. Five of the F_2 progeny gave particularly high yields of good quality kapok. The Javanese form produces a large number of pods per cluster and its annual yields of pods and floss per tree are higher than those of the Philippine form or the hybrids. But, if the amount of floss per 100 pods is considered the hybrids were the highest yielders. The Javanese floss is poorest in quality but this form is useful for breeding on account of its high yielding capacity, especially in the number of pods per cluster.

2880 Rajan, S. S. & Thakare, R. G.
Chromosome numbers of some Linum species.
Indian Oilseeds J. 1959 : **3** : 43–44.

The following *n* numbers are reported: *L. tenue*, *L. floccosum*, *L. pallesoenoe*,* 15; *L. gallicum*, *L. maritimum*, 10; and *L. strictum*, 9.

2881 Kiss, E.
Adatok len-fajtagyűjtemény feldolgozásához. I. (**Data on the evaluation of a collection of flax varieties. I**).
Magyar tud. Akad. Agrártud. Oszt. Közl. 1958 : **14** : 85–96.

A world collection of flax varieties has been studied at Sopronhorpács, Hungary, over a period of four years. A numerical classification based on size, colour and shape of the flowers, capsules and seeds has been developed and tables are presented giving values for these and other characters. The use of the data in the selection of material for breeding is discussed.

2882 Nueva raza de *Melampsora lini* para nuestro país. (**A new race of *M. lini* in our country**).
Idia 1958 : No. 128 : p. 24.

A new race of *M. lini* able to attack the flax variety Bombay has been discovered at the Pergamino Experimental Station, Argentina. Bombay, which is resistant to races 19, 22, 40 and 42, is the parent of several recently developed varieties.

* ?*pallescens.*

2883 Ceapoiu, N. & Itoafă, E.
Comportarea hibrizilor de cînepă din generația a II-a (F_2) pe diferite agrofonduri. [**The behaviour of second-generation (F_2) hemp hybrids in different agronomic environments**].
An. Lucrăr. ști. Inst. agron. N. Bălcescu București 1957 : 113–25.

Five F_2 hybrid progenies from crosses involving the varieties Bologna, Carmagnola-Cluj and Kastamonu were grown under seven sets of agronomic conditions. Data are provided on stem, fibre and seed production. Heterosis, which had been apparent in the F_1 generation, disappeared in the F_2. Some reciprocal differences however persisted into the F_2. [Cf. XXVII, 3237 and 3797].

2884 Bócsa, I.
Kísérletek a magyar egylaki kender előállítására. (**Experiments on the production of an Hungarian monecious hemp**).
Magyar tud. Akad. Agrártud. Oszt. Közl. 1958 : **14** : 65–84.

By means of inbreeding and selection in monecious individuals occurring in Fleischmann's "F" hemp, the proportion of monecious plants was increased from 6·9% in the initial material in 1951 to 48% in 1953. From 1954 onwards all protogynous individuals were discarded, giving finally an average of 71·7% monecy. Some incidental effects of inbreeding are noted [cf. 1785].

2885 Bellini, P.
Indagini intorno al miglioramento genetico della canapa (*Cannabis sativa* L.): I. Sull'accertamento precoce della quota individuale in tiglio. [**Investigations concerning the genetic improvement of hemp (*C. sativa* L.) : I. The early determination of the fibre content of individual plants**].
Agricoltura ital. 1958 : **58** : 112–22.

In portions of the stem 70 cm. in length taken just below the middle of the stems when they had reached their maximum length but before anthesis, the percentage of cortex was determined on a dry-weight basis. A correlation of + 0·714 was established between the cortex percentage determined in this way and the fibre content determined in mature stems in male plants of the variety Carmagnola; in the female plants the correlation was + 0·655. The determination of the cortex percentage, being simpler, is therefore to be adopted in future in breeding hemp for improved fibre quality.

2886 Libonati, V. F.
A juta na Amazônia. (**Jute in the Amazon basin**).
Bol. téc. Inst. agron. Norte 1958 : No. **34** : Pp. 83.

In the first part of this report, a short account is included of the four varieties of *C. capsularis* at present grown in this region. In the second part, mention is made of the jute-breeding work of the Instituto Agrônomico do Norte, Belém. Selection for fibre production within the variety Oyama was ineffective. Hybridization between lines and between varieties is now being tried.

2887 Sharma, A. K. & Roy, M.
Cytological studies on jute and its allies. I.
Agron. lusit. 1958 : **20** : 5–15.

Chromosome morphology and meiosis in *Corchorus olitorius, C. capsularis, C. acutangulus* and *C. siliquosus* are described. The three first species have $2n = 14$; in *C. siliquosus*, $2n = 28$. The first two species can be distinguished cytologically by the comparatively larger chromosomes of *C. capsularis*. *C. siliquosus* has some genomes at least that differ from those of *C. olitorius* and *C. capsularis*. In the two species last mentioned, meiosis is regular. In *C. acutangulus*, meiotic aberrations occur; in particular chromatinic "microbodies" of uncertain origin are formed and chromosome disjunction is irregular. It is pointed out that the polyploid *C. siliquosus* is a small delicate herb in contrast to the stalwart diploids.

2888 Datta, R. M.
Chromosome studies in the genus *Corchorus*.
Indian Agric. 1958 : **2** : 120–22.

PMCs with hypoploid and hyperploid numbers were observed in *C. trilocularis, C. aestuans* (*C. acutangulus*), *C. tridens, C. olitorius* and *C. capsularis* ($n = 7$). Secondary association observed in *C. olitorius* suggested that this species has a basic number of $x = 5$. Attachment of two bivalents to the nucleolus was frequently seen in this and the other $n = 7$ species, providing further evidence of secondary polyploidy. Cells with 2 nucleoli were of frequent occurrence in *C. siliquosus* ($n = 14$). One PMC in this species contained 2 bivalents attached to the nucleolus, 6 other bivalents, 4 univalents and 2 quadrivalents of the chain type.

2889 Riley, H. P.
Polyploidy in South African species of Aloë.
Amer. J. Bot. 1959 : **46** : 126–29.

Chromosome numbers were determined in 167

plants representing 40 species of *Aloe* and in one unidentified plant. Polyploidy was found to be uncommon, all but two plants having a diploid complement of 8 long and 6 short chromosomes. The two exceptional plants belonged to *A. ciliaris* and were hexaploid ($2n = 42$).

2890 NUR, N.
Observasi pada *Musa textilis* Née. Bagian pertama. Tjatatan[2] menganai biologi bunga. (**Observations on *Musa textilis* Née. I. Notes on the floral biology**).
Pemb. Balai Besar Penj. Pert., Bogor 1958 : No. 151 : Pp. 115.

The inflorescence of *M. textilis*, which consists of an axis bearing clusters of female flowers at the base and male clusters at the top, with occasional hermaphrodite clusters in the intermediate zone, is protogynous. Blooming of the flowers begins in the late afternoon, the stigma becoming sticky and receptive for two days. During this period receptivity decreases, the pH of the stigma drops from 6 to 5 or 4 and stigma colour changes from yellowish white to blue. The best time for pollination is early morning. Pollen remains viable for two days after maturity, a period which was not affected by storage at different temperatures and humidity. Cross pollination is usual and is effected by bats pertaining to the Macroglossinae. Selfing may occur but tends to give rise to fruits with fewer seeds than those obtained by crossing. Open pollination proved more effective than artificial cross pollination.

2891 FURUSATO, K.
(**The fibre of tetraploid *Luffa cylindrica***).
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1957 : No. 8 : 103–04. [Japanese].

The fibres of colchicine-induced tetraploids of the variety Tsurukubi [Crane's Neck] are thicker and heavier than those of the diploids but are not appreciably stronger.

SUGAR AND STARCH PLANTS

Proceedings of the Thirty-First Annual Congress of the South African Sugar Technologists' Association, held in Durban 25-29th March, 1957 : Pp. 149.

2892 *du Toit, J. L. Annual summary of agricultural data for the sugarcane crop, 1954–55.* (*pp. 30–38*).

The record yield in the season 1954–55 has been in part due to the replacement of lower-yielding varieties by new and improved ones. N : Co.310 is the highest yielding and has also the highest sucrose content.

2893 *King, N. C. & Dick, J. A critical comparison of methods of testing for resistance to mosaic.* (*pp. 116–18*).

Methods for determining the resistance of sugarcane varieties to mosaic suggest that a number of varieties, while immune in the field, can be infected by artificial means. The only variety found to be immune under all conditions of experimentation is 50/215.

2894 *Bret, P. G. C. Recent developments in sugarcane breeding and the present variety position in Natal.* (*pp. 138–42*).

The value of particular crosses may be fairly reliably estimated at the single stool stage, but selection at this stage within a cross does not provide an efficient means of separating out a few superior seedlings. More efficient selection is likely to result by having a large number of small single plots with ample controls. Promising new varieties still under trial are N50/123, from N : Co.310 x Co.331, and N.50/211, from POJ2725 x Co.285. Of two varieties intended for distribution in 1957, N : Co.334 (Co.421 x Co.312) is fairly resistant to smut and may be useful in the coastal sands, and N : Co.382 (POJ2725 x Co.301) is similar but more resistant to mosaic than the former.
N : Co.376 is adapted to a wide range of conditions and is expected to replace Co.301 and Co.331, and perhaps N : Co.310 in some less fertile areas, but is less resistant to mosaic than was formerly supposed.
N : Co.293 is increasing in popularity where flowering is not profuse and smut disease not prevalent.
N : Co.339 gives good yields on the coastal sands and at higher altitudes; it ratoons well and is unusually tolerant of mosaic disease. But its many weak points make its probability of success uncertain.

2895 *Thomson, G. M. Gumming disease of sugarcane in Natal.* (*pp. 143–48*).

Variety N : Co.310 appears to be the most susceptible to gumming (*Xanthomonas vasculorum*), which is of small incidence among other varieties according to present data.

2896 CONSTANCIO LÁZARO, R.
Fitotecnia de caña de azúcar. (**Sugar cane breeding**).
Rev. Asoc. Ing. Uruguay 1958 : **30** : No. 102 : 43–48.

A general account is presented of methods used

in crossing and selecting sugar cane, special reference being made to those developed at the University of Louisiana.

2897 Bremer, G.
Increase of chromosome number in species-hybrids of *Saccharum* in relation to the embryo-sac development.
Bibliogr. genet. 1959 : **18** : Pp. 99.

A complete report is presented of cytoembryological investigations of which a brief account has appeared earlier [XIX, 2712]. The chief cane investigated was POJ2875 (POJ2364 x EK28) with $2n = 110$, representing a third nobilization of *S. spontaneum*. The other clones investigated were POJ2364 (POJ100 x Kassoer) with $2n = 148$, representing a second nobilization; POJ2878 ($2n = 119$), with the same parentage as POJ2875; POJ2940 ($2n = 97$) from POJ2722 x EK28, POJ2944 ($2n = 120$) from POJ2875 x EK28 and POJ2947 ($2n = 120$) from POJ2875 x SW3, all these clones representing fourth nobilizations, *S. officinarum* 'Bandjarmasin hitam' and 'DI52', both with $2n = 80$; G107 (*S. officinarum* x *S. spontaneum*), $2n = 136$; 1228P2 (POJ2875 x *S. spontaneum*), $2n = 166$; *S. barberi* 'Maneria', $2n = 91$; and five Javanese clones of *S. spontaneum*, $2n = 112$. Reduction to the haploid number during meiosis I was observed in all the clones. Subsequently one of the following events occurred. (1) The chromosome number remained reduced, probably in those cases in which meiosis I and II were followed quickly by transition of the nucleus of the chalazal cell of the megaspore tetrad into the resting stage, the other cells of the tetrad degenerating. (2) The ovule became sterile as the result of degeneration of all the cells of the tetrad. (3) Redoubling took place by endoduplication of all the chromosomes in the chalazal cell. (4) Some but not all of the chromosomes divided in the chalazal tetrad nucleus. (5) The reduced number was restored to the unreduced number by endoduplication of all the chromosomes in the nucleus of the chalazal cell of the dyad after normal meiosis I, this nucleus developing into the primary nucleus of the embryo sac without undergoing meiosis II. (6) In relatively rare cases, chromosomes dividing in the chalazal nucleus of the dyad again divided, so that a tetraploid embryo sac was formed. These observations were verified by chromosome counts of dividing nuclei in young embryo sacs and in the embryo and endosperm. In *S. spontaneum*, the formation of reduced ♀ gametes predominated. Many ovules were sterile in POJ2875, Bandjarmasin hitam and Maneria. Ovule sterility was absent or rare in POJ2878 and three *S. spontaneum* clones. Doubling of the chromosomes in the chalazal nuclei was most frequent in POJ2875. The author gives a comprehensive discussion of these findings in relation to the results he has obtained in interspecific hybridization of *Saccharum* and those of other investigators. He reaches the conclusion that increases in chromosome number attributable to the ♀ parent may in most cases be interpreted on the basis of complete or partial endoduplication during megasporogenesis, whether pseudogamy or fertilization occurs. Wide differences may exist between reduced and unreduced ♀ gametes of a particular parent as regards compatibility with the same ♂ parent, the tendency towards parthenogenesis playing an important part in this connexion. The author also considers the role of the ♂ parent in increasing the chromosome number, as well as reports of endopolyploidy in somatic and reproductive cells in *Allium* and other genera.

2898 Stevenson, G. C.
Sugar cane varieties in Barbados. An historical review.
Bull. Brit. W. Ind. Sug. Cane Sta. 1958 : No. 39 : Pp. 26.

A historical review of the varieties of sugar cane in Barbados and the more recent breeding work is given.

2899 Durairaj, D. J.
Study of total solids - sucrose content relationship in sugarcane juice with reference to varieties.
Madras agric. J. 1958 : **45** : 377–91.

From a study of 24 Coimbatore varieties, it was ascertained that the regression coefficient for Brix : sucrose is a varietal constant. Moreover, the regression coefficient is related to maturation period of the varieties; for regression coefficients between 1·0 and 1·5, the correlation with maturity index is positive; for regression coefficients below or above this range, the correlation is negative.

2900 Warner, J. N.
The 1957 sugar cane collecting expedition.
Rep. Hawaiian Sug. Tech. 1957 : **16** : p. 16.

Organized by the Plant Introduction Section of the US Department of Agriculture, the above expedition to New Guinea collected cuttings of 192 clones of *Saccharum officinarum*, 42 of *S. robustum* and 26 of *S. edule*. A form of *S.*

rubustum with succulent tops used locally for chewing was found on the Sepik River and may be of interest in connexion with the origin of the cultivated chewing canes.

2901 Warner, J. N. & Grassl, C. O.
The 1957 sugar cane expedition to Melanesia.
Hawaii. Plant. Rec. 1958 : **55** : 209–36.
An account is given of the expedition to New Guinea and the Solomon Islands, sponsored by the US Department of Agriculture with the cooperation of the Hawaiian Sugar Planters' Association and Queensland Bureau of Sugar Experiment Stations. The forms of *Saccharum officinarum, S. robustum, S. spontaneum* and *S. edule* collected are discussed and appendices list the collections of these species and also of miscellaneous grasses related to *Saccharum.* It is concluded that the expedition has provided further evidence in support of the view that the centre of origin of *S. officinarum* is situated in the New Guinea area, the greatest number of clones of this species being found in this region, as well as a large number of forms of the closely related *S. robustum.* Whether *S. officinarum* originated out of wild populations of softer and sweeter canes through gradual selection, or from wild canes brought into cultivation for fences or other uses, is not yet known. Furthermore, there remains the possibility that a locality will be found where *S. officinarum* or similar types exist as wild canes. Suggestions are made concerning areas where further collection would be valuable.

2902 Willcox, O. W.
Inverse yield nitrogen law in sugar agriculture.
Sugar, Lond. 1955 : **50** : No. 1 : 41–44.
Selection of cane varieties by nitrogen content.
Ibid 1958 : **53** : No. 5 : 32–34.
It is pointed out that high dry-matter yield is correlated with low nitrogen content and that nitrogen content may therefore be used as a selection index. In selection, analysis for total N in the whole aerial portion of the plant is recommended, but total N in millable stalks at comparable ages may be found satisfactory; preliminary tests for the latter procedure should be made. Analysis is best carried out at harvest time. It is noted that, in general, adverse environmental conditions will reduce yield without necessarily reducing nitrogen uptake. In making the tests, the total available soil N should not exceed about 355 lb./acre together with about 400 lb. available P_2O_5 and 304 lb. available K_2O.

2903 Martin, J. P., Bianchi, F. A., Mangelsdorf, A. J. & Jensen, H. J.
Some genetic and other biological aspects of varietal yield decline.
Rep. Hawaiian Sug. Tech. 1957 : **16** : 17–20.
This paper comprises four short contributions, one by each author, on the above problem. A. J. Mangelsdorf, pointing out that yield decline in a variety is likely to occur if it is grown in monoculture for a length of time sufficient to allow the pathogen complex to become adapted to it, stressed the importance of genetic diversity in varieties used for replacement. The large and varied collection being built up at the Experimental Station of the Hawaiian Sugar Planters allows diversity to be attained through the use of a wide range of parents in crosses. The other contributors were chiefly concerned with methods of pathogen control.

2904 Abbott, E. V.
Strains of sugarcane mosaic virus in Louisiana.
Sug. Bull., N. Orleans 1958 : **37** : 49–51.
The occurrence of strains of the above virus in Louisiana during the past four decades is briefly surveyed. Recently a new strain capable of attacking the ordinarily resistant variety CP44–101 has appeared.

2905 Ruebenbauer, Z.
Nowe drogi w hodowli buraka. (**New trends in sugar-beet breeding**).
Postępy Nauk Roln. 1956 : **3** : No. 6 : 43–62.
It is noted that breeding based on heterosis is in progress at the K. Buszczyński Sugar Beet Breeding Institute in Poland. Work by Swedish, German and American authors is reviewed.

2906 Crombie, B.
Our future sugar beet.
Biatas, Dublin 1959 : **12** : 681–85, 687.
A popular account is given of work on breeding for sugar content, juice quality, improved capacity to germinate under adverse conditions and resistance to bolting, frost and *Ramularia,* and on polyploids and the monogerm character at the Plant Breeding Laboratory, Thurles, Irish Republic.

2907 GRAF, A.
Zuckerrübensortenbericht 1956. (**Report of sugar beet varieties 1956**).
Flugbl. Ver. Zuckerrübenforsch. 1957 : No. 12 : unpaginated.
Trials held in three different regions of Austria are reported; the polyploid varieties gave the best results.

2908 GRAF, A.
Erläuterungen zu den Sortenberichten. (**Explanations concerning the varietal trials**).
Flugbl. Ver. Zuckerrübenforsch. 1958 : No. 16 : unpaginated.
Notes are provided on the characteristics of four regions in Austria, in which sugar-beet varietal trials are conducted by the Federal Institute for Plant Cultivation and Seed Testing. Also explanations of how the yield data are compiled and the varieties classified are included.

2909 GRAF, A.
Zuckerrübensortenbericht, Zusammenfassung 1957. (**Report of sugar beet varieties, summary 1957**).
Flugbl. Ver. Zuckerrübenforsch. 1958 : No. 17 : unpaginated.
The results are reported of trials lasting over several years and conducted in four regions in Austria. Diploid and polyploid varieties were tested and some of the latter gave the best yields of roots and sugar.

Relazione del settimo anno di attività del Comitato Tecnico Permanente del A.N.B. (**Report of the seventh year of activity of the Permanent Technical Committee of the National Association of Beet Growers**).
Bologna 1958 : Pp. 253.

2910 *Gallarate, G. & Zocca, A. Indagini su varietà di barbabietole da zucchero svolte nel 1957. (Investigations on sugar-beet varieties carried out in 1957) (pp. 39–127).*
In the trials for the year under review [cf. 541], comprising tests of 15 cultivars in different parts of Italy, the polyploid varieties gave the highest yields throughout, exceeding the others by 6·4–14·8% in root yield and by 9–10·2% in yield of sugar. They exceeded the E types in sugar percentage but were below the N types in this respect. The difference in total sugar yield between the highest, Maribo E, and the lowest, Buszczyński NE, amounted to 23·8%; the difference in yield of roots was still greater and Hilleshög Polyploid was 34·0% higher than AJ3, the last-named being the variety with the highest sugar percentage. The polyploid varieties bred in Italy were higher in sugar content than the polyploids from elsewhere and produced a somewhat higher total yield of sugar; the varieties that did best in this respect were Maribo E, Hilleshög Polyploid, Mezzano E and Mezzano NE. When the roots were lifted rather earlier a somewhat different order of merit was obtained, since Hilleshög and Klein polyploids are both earlier in maturity than Maribo. Resistance to *Cercospora* was highest in Alba NE, followed by Cesena E and Mezzano E; foreign diploids and all polyploid varieties were less resistant. Bolting was less marked in the foreign than the Italian varieties.
A certain number of new and less well-known varieties were also tested and the results are presented. Those that seemed to show the most promise for Italian conditions were Polykuhn, Belge X–E, Polysaros, Polybrand and Desprez GO.
Special trials to test reaction to *Cercospora* showed that all varieties, even those classed as resistant, benefited by fungicidal treatment.
In autumn sowings of material furnished specially for the purpose from a number of sources, the lowest percentage of bolting was found in Rovigo AU, Klein AA, Cesena NSA and US75; certain other varieties had a higher percentage of bolting, which however occurred late and did not greatly reduce the sugar yield; such varieties were Pedigree SSA and Zwaanesse III from the Netherlands and Battle's E from England.

2911 ALDROVANDI, A.
Una pianta creata dall'uomo "la barbabietola da zucchero". (**A plant created by man—sugar beet**).
Agricoltura d. Venezie 1958 : **12** : 198–206.
The conversion of the wild *Beta maritima* into the present-day sugar beets by selection and hybridization is traced once more for the benefit of Italian readers, mention being made also of the application of modern techniques such as the use of male sterility, polyploidy and, finally, artificial illumination for selecting strains free from bolting that can be sown in the autumn in southern Italy. The recently produced monogerm varieties are also considered promising for growing in Italy.

2912 BRUMMER, V.
Sokerijuurikkaan lajikekokeiden tuloksia. (**Results of sugar-beet variety trials**).
Maatalous ja Koetoiminta 1958 : **12** : 198–203.
A number of varieties were compared for yield

and sugar content as well as for their performance on different soils; Hilleshög K is taken as standard. The variety Hilleshög KL shows a superior performance on clay soils and loams. Hilleshög KL polyploid has also been tried but has so far not shown superiority to Hilleshög KL.

2913 Kretinin, T. N.
(Beet growing in the Rumanian People's Republic).
Sahar. Svekla (Sug. Beet) 1958 : No. 5 : 43–45. [Russian].

The recent Rumanian sugar-beet varieties Lovrin 532 and Cîmpia Turzii 24 are mentioned for their productiveness. They yield 11 c. more roots per ha. than the older Polish varieties ČLR and MLR and 13% more sugar per unit area.

2914 Gutstein, I. [Gutstin, Y.] & Weizman [Witsman], L.
(Testing sugar-beet varieties).
Sadeh (Field)/Hassadeh 1958 : **38** : 1063–67. [Hebrew].

Varietal trials for adaptability to winter growing in subtropical areas in Israel are reported. The best results were given by Kuhn R, Zwaanesse III, Eagle Hill 8321 Poly and Cesena R. Sugar percentage was highest in Eagle Hill 8321 Poly.

2915 Meier, W.
Ergebnisse der Sortenprüfung bei Zuckerrüben 1956–1958. **(Results of the variety testing with sugar beets, 1956-1958).**
Mitt. schweiz. Landw. 1959 : **7** : 33–36.

The results are reported of trials conducted at several centres in Switzerland. Notes are provided on the important characteristics of the four varieties tested. Cercopoly is resistant to *Cercospora* and Kleinwanzleben Polybeta and Maribo P gave the highest yields of roots and sugar per ha.

2916 Peterson, D. F. & Dickenson, D. D.
Results of divergent selection for general combining ability.
J. Amer. Soc. Sug. Beet Tech. 1959 : **10** : 60–65.

A report is presented of investigations carried out by the Holly Sugar Corporation, USA. Data on yield are presented for eight lines selected for either high or low general combining ability, using a red beet as a top-cross tester [cf. XXVII, 3272]. Also the average yields of single crosses between these eight lines and three male-sterile lines are reported.

The data show that on the average the single crosses involving lines high in general combining ability produced a greater tonnage per acre, a lower percentage of sucrose and more sugar per acre than the crosses of lines low in general combining ability. Four single crosses showing heterosis or dominance for sucrose percentage had pollen parents from the high-combining group. Crosses yielding most sugar per acre were those whose parents were high in general combining ability when crossed to the red-marker beet and also showed heterosis for sucrose percentage.

2917 Powers, L., Robertson, D. W., Whitney, R. S. & Schmehl, W. R.
Population genetic studies with sugar beets (*Beta vulgaris* L.) at different levels of soil fertility.
J. Amer. Soc. Sug. Beet Tech. 1958 : **9**: 637–76.

An analysis of a split-plot trial involving the commercial variety A54–1, A54–1BB (bulked selection of A54–1), the inbred 50–406, 50–406BB (bulked selection of 50–406), the inbred 52–307, and the F_1 hybrid of the inbreds, and two treatments, unfertilized and fertilized with N and P, is reported. The characters studied were sucrose percentage, root weight, and nitrate level in the petiole. Nitrate level in the petiole was positively associated with root weight and negatively with sucrose percentage. The F_1 hybrid was heterotic for sucrose percentage. The variety x treatment interaction for sucrose percentage was highly significant. A54–1, A54–1BB and 50–406 had lower sucrose percentages in the fertilized plots; the other varieties were not so affected. Variety x treatment interactions were also observed for nitrate level in the petiole and root weight. Since the sucrose percentage of the F_1 hybrid and 52–307 is not diminished by fertilizing, this character appears to be dominant. However, the ability of the other inbred, 50–406, to produce a high sucrose percentage on unfertilized plots is also dominant and the heterosis for sucrose percentage of the F_1 hybrid appears to result from the interaction of these two dominant conditions. Selection for high root weight and high sucrose percentage within the A54–1 population in unfertilized plots was performed and its effectiveness demonstrated in a polycross progeny test conducted at a high fertility level. It is concluded that it is desirable to carry out

breeding programmes at the soil fertility level at which the crop is to be grown commercially.

2918 Powers, L., Robertson, D. W. & Clark, A. G.
Estimation by the partitioning method of the numbers and proportions of genetic deviates in certain classes of frequency distributions.
J. Amer. Soc. Sug. Beet Tech. 1958 : **9** : 677–96.

Using the data described in the preceding abstract, a method of determining the proportion of genetically inferior or superior deviates in certain classes of the obtained frequency distributions of segregating populations is described. In essence the method consists of a comparison between the actual frequency distribution and the calculated frequency distribution based on the observed population mean, the estimated environmental standard error and tables of the normal probability integral. Whether or not the environmental variability follows the normal probability integral is tested by comparing the observed and calculated frequency distributions of nonsegregating populations, in the case under consideration, the F_1 hybrid.

2919 Powers, L., Robertson, D. W. & Remmenga, E. E.
Estimation of the environmental variances and testing reliability of residual variances for weight per root in sugar beets.
J. Amer. Soc. Sug. Beet Tech. 1958 : **9** : 697–708.

Using the data reported above [2918] by way of illustration, a method of testing whether the residual variances (observed variance — estimated environmental variance) are significantly different from zero is described, both for the entire experiment and within treatments. The environmental variances are estimated by regression; it was found that the relation between means and variances was essentially linear.

2920 Matsumura, S.
(Cytological and genetic studies on sugar beet. VI. Comparison between various triploid combinations, in particular, those involving American disease-resistant varieties).
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1957 : No. 8 : 75–82. [Japanese].

This paper is the full version of a preliminary report already abstracted [XXVIII, 3877].

2921 Butterfass, T.
Die praktische Ermittlung des Ploidiegrads von Zuckerrüben durch Zählen der Schliesszellen-Chloroplasten. (**The practical determination of the degree of ploidy of sugar beets by counting the chloroplasts of the guard cells**).
Züchter 1958 : **28** : 309–14.

Mochizuki and Sueoka showed that $2n$, $3n$ and $4n$ beets have different numbers of chloroplasts in the guard cells [cf. XXVII, 2075]. Methods are now described which facilitate the counting of the chloroplasts of the guard cells. It is suggested that either silver nitrate or iodine solution be added together with a wetting agent such as Marlon paste to a small piece of fresh epidermis lying on a slide.
Also the accuracy of these determinations was investigated. It was found that for separating a mixture of $2n$, $3n$ and $4n$ plants, 10 counts per epidermis usually provide satisfactory results. Chloroplasts can be counted more quickly than chromosomes.

2922 Owen, F. V. & McFarlane, J. S.
Successive annual backcrosses to a nonbolting inbred line of sugar beets.
J. Amer. Soc. Sug. Beet Tech. 1958 : **10** : 124–32.

The results of successive backcrosses of a cross between an extremely fast-bolting annual sugar beet and a bolting-resistant biennial type, with the latter as recurrent parent, are described. The annual habit of the former parent depended on a single gene, *B*, derived from Munerati's annual beet [cf. II, 256] and having the effect of rendering unnecessary the prolonged low-temperature treatment required for reproductive development in biennial beets. Rate of bolting is attributed to the action of accessory genes in association with *B*. The recurrent parent was the self-fertile inbred NB1, developed for an extreme degree of resistance to bolting in autumn or winter plantings in California. Back-cross segregates carrying *B* initiated seed stalks and became fully reproductive in June and July plantings under continuous illumination. Selection for extremely slow-bolting annuals after the third back cross resulted in the recovery of annual types very slow in bolting. These required more time for seed-stalk initiation but the final genetic ratio for annual *vs.* biennial segregates was not affected. The previously reported linkage between *B* and *R* for red hypocotyls was confirmed. Use of *B* offers the breeder a rapid means of incorporating new qualitative genes into established biennial lines.

Application of gibberellic acid hastened seed-stalk initiation and reproductive development of the slow-bolting annual beets and may therefore be of additional use. Annual beets may eventually also be used for several types of index crosses. They may, for instance, be utilized in the determination of the influence of specific biennial pollinators in relation to cytoplasmic male sterility or, once the isogenic annual lines have been developed, for the evaluation of the bolting resistance of specific pollinators.

2923 Donà dalle Rose, A.
Sull'impiego dell'acido gibberellico nella pratica della produzione del semebietole e della selezione per la resistenza alla "prefioritura". (**The use of gibberellic acid in the production of beet seed in practice and in breeding for resistance to bolting**).
Agricoltura d. Venezie 1959 : **13** : 114–36.

Plants of sugar beet treated with the potassium salt of gibberellic acid were 9–10 days earlier in flowering and maturity than the controls but their seed yield was less. Application of gibberellic acid to plants of three types of sugar beet differing in tendency towards bolting caused a slight increase in the percentage of bolting though the differences were not highly significant. The increase was observed even in the variety Cesena NSA, which is normally almost completely free from bolting. No significant difference was recorded in root yield or in contents of sugar, nitrogen or ash.

2924 Brykczyński, J.
Dyspersja pyłku w szkółkach wysadkowych buraków cukrowych. (**Pollen disperal in sugar-beet seed plots**).
Roczn. Nauk rol. : Ser. A : 1957 : **75** : 245–53.

At the Rogów Opolski Station in Poland, the degree of natural crossing, determined through the use of red-rooted and white-rooted parents, was about 67% when single plants were grown side by side, was 44·2% where groups of plants were used and decreased rapidly with increasing isolation distances in a ratio which approaches a hyperbolic curve.

2925 Lüdecke, H. & Feyerabend, I.
Beiträge zum Saponingehalt der Zuckerrübe. (**Contributions on the saponin content of the sugar beet**).
Zucker, Hannover 1958 : **11** : 389–93.

The saponin content in roots and foliage of several varieties and breeding lines was determined. The formation of saponin appeared to be closely related to that of sugar, the Z lines having the highest saponin contents.

2926 Wood, R. R., Bush, H. L. & Oldemeyer, R. K.
The sucrose-sodium relationship in selecting sugar beets.
J. Amer. Soc. Sug. Beet Tech. 1958 : **10** : 133–37.

In investigations at the Great Western Sugar Company, Longmont, Colo., roots of the commercial variety GW359 with weight and sucrose content above the population means were classified for sucrose content. From the individuals within each sucrose category, equal numbers of roots with high and low content of Na were selected, to comprise two main groups, (1) high sucrose + high Na and (2) high sucrose + low Na. Seed was harvested from about 50 roots in each group and tests were carried out on the original population and the progenies of the two groups in 1956 and 1957. Selection was effective in reducing the Na content in the progeny of (2). No significant upward change in the Na content of the progeny of (1) was evident. It is however pointed out that the difference between the mean of the original population and that of (1) was only 0·006, whereas the corresponding difference for (2) was 0·030. In both groups selection resulted in a significant increase over the parent in sucrose content, but the progeny of (1) was significantly higher in sucrose content than the progeny of (2). The inverse relationship between sucrose percentage and root weight appears however to be of such magnitude that selection to increase sucrose percentage based on the sucrose-Na relationship is accompanied by loss in tonnage to the extent that total sucrose production per acre remains unchanged. Finker and Bauserman [XXVII, 2076] found a positive and significant correlation between root weight and Na content; the possible significance of such an association in breeding is briefly examined.

2927 Grimm, H. G.
Röntgendiagnostik bei Zuckerrübensaatgut. (**X-ray diagnosis of sugar-beet seed**).
Zucker, Hannover 1958 : **11** : 302–06.

From X-ray photographs of sugar-beet seed, it is possible to determine the percentage of seeds without embryos. Such photographs are useful when the breeder wishes to find out which inbred lines may be successfully crossed for the production of hybrid seed.

2928 Schuster, M. L., Jensen, S. G. & Sayre, R. M.
Toothpick method of inoculating sugar beets for determining pathogenicity of *Rhizoctonia solani*.
J. Amer. Soc. Sug. Beet Tech. 1958 : **10** : 142–49.

The results obtained by using the toothpick method of inoculation with *Rh. solani* (*Pellicularia filamentosa*) in the greenhouse and field are reported. The technique appears to be promising in some respects as a means of determining the reactions of varieties and species of *Beta*. It is however pointed out that the results may require confirmation from tests in which other methods are employed, since this way of introducing the pathogen into the host is artificial and possibly too drastic. The occurrence of strains differing in pathogenicity constitutes an additional problem. Evaluation of varietal reactions according to observations on seedlings infected by soil inoculation does not provide an indication of the reactions of more mature beets to the severe crown-rot phase occurring most frequently late in the season.

2929 Mizuno, S.
(Studies on the morphology of the floral organs of the yam *Dioscorea Batatas* Decne. IV. On the structure of the floral organs of Nagaimo).
Hyogo Noka Diagaku Kenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. 1955 : **2** : 35–36. [Japanese].

Two strains of the variety Nagaimo [Long Tuber] are differentiated, a hermaphrodite strain in Osaka and a male strain in Sapporo.

STIMULANTS

2930 Madamba, U. V. & Edrozo, L. B.
A progress report on the performance of five varieties of White Burley tobacco under Luna, Mt. Province conditions.
Philipp. J. Agric. 1955 : **20** : 141–56.

A two-year comparative study of five White Burley tobacco varieties, Haranova, Harrow Velvet, Ky16, Ky52 and Johnson Root Rot Resistant White Burley, was made. Data for plant height, number and size of leaves, internode length, stalk circumference and yield are given. Johnson Root Rot Resistant White Burley gave the highest yield of partially fermented leaves, and Ky16 was second. In quality, Ky16 and Harrow Velvet were the best. Johnson Root Rot Resistant White Burley is not as well adapted to Philippine conditions as Ky16 and Ky52, but is important as a parent for breeding for root-rot resistance to which most White Burley varieties are susceptible.

2931 Edrozo, L. B., Madamba, U. V. & Apostol, H.
A preliminary study of five varieties of Turkish tobacco.
Philipp. J. Agric. 1955 : **20** : 209–23.

The leaves, stem, resistance to diseases and pests, yield and quality are compared for Samsoun, Xanthi, Cavalla 20, Sariyaka and Smyrna varieties of Turkish tobacco in the Philippine Islands. Results showed that Samsoun is the best variety for yield and quality of leaves, followed by Xanthi in the Luna area of Mountain Province.

2932 Papaioannou, C. & Izard, C.
Cytogénétique d'une mutation haploïde d'un hybride intervariétal de *N. tabacum* L. **(Cytogenetics of a haploid mutation of an intervarietal hybrid of *N. tabacum* L.).**
CR Acad. Sci., Paris 1959 : **248** : 1025–28.

A haploid tobacco ($2n = 24$), found in a population of Corolle double X [Double Corolla X] x Cabot treated with fumes of allyl isothiocyanate, resembled the diploid in morphology but was less vigorous and was reduced in all its parts. It was highly sterile, normally had no bivalents, though up to three were occasionally seen, and showed very irregular chromosome distribution to the poles.

2933 Peens, J. F.
Natuurlike kruisbestuiwing by tabak (*Nicotiana tabacum*). [**Natural cross pollination in tobacco (*N. tabacum*)**].
S. Afr. J. agric. Sci. 1958 : **1** : 237–44.

In studies conducted at Rustenburg, South Africa, the degree of pollination occurring between (*a*) emasculated and untreated plants of Yellow Mammoth, (*b*) Yellow Mammoth and the variety Joiner 270, which is dominant and homozygous for red flowers, and (*c*) male-sterile and normal plants of variety 402 barely exceeded 0·50% when the parents were only 3 feet apart and decreased to 0·30% at an isolation distance of 24 ft.

2934 Kadam, B. S. & Murty, B. R.
Further studies on the inheritance of leaf and flower characters in *Nicotiana tabacum* L.
Indian J. Genet. 1958 : **18** : 16–33.

The varieties used for these investigations at the Central Tobacco Research Institute, Rajagmundry, were Red Pigmented Kelieu (RPK),

Black Spangled Kelieu (BSK), a mutant of Amarelo 5 (A5) with "creamy" plant colour and NP Hybrid 9. The reddish pigmentation of the leaf in RPK depended on duplicate genes, rp_1 and rp_2. The other three varieties carried both dominant alleles. The curved tip of the leaf of RPK was recessive to straight tip and determined by a single gene (*lht*). The creamy plant colour of A5 was dominant over the green colour of the other varieties and governed by a single gene (*Cr*). Pink flower colour was dominant over white and dependent upon complementary genes, Pk_a and Pk_b. Green colour of the throat of the flowers in RPK and BSK behaved as a monogenic character (*Thg*), dominant to the white throat of A5. Fluted throat was dominant to constricted, the latter type being dominant to funnel-shaped. The alleles in question are respectively designated Th^{fl}, th^c and th^f. Stigma position above the anthers was dominant to a position almost level with the anthers or below them, dependent on the complementary genes St_a and St_b, and suppressed by an inhibitor (I_{st}). Narrowness of the anthers was recessive to broad shape, the duplicate genes Anr_1 and Anr_2 being responsible for broad anthers. Green filament was monogenic (*Fg*) and dominant to white. The red pigmentation of the capsule teeth in RPK depended on one of the two duplicate genes for red leaves. The linkage groups Th^{fl}–I_{st}–*Lht* and *Fg–Thg–Cr* were established. Possibly Pk_a belongs to the latter group.

2935 Prakken, R. & van der Veen, J. H.
Bloemkleur en zaadkwaliteit bij *Nicotiana tabacum*. **(Flower colour and seed quality in *N. tabacum*).**
Genen en Phaenen 1958 : **3** : 29–43.

This is a more detailed account of work already summarized [1074].

2936 Povilaitis, B.
Varietal reactions to weather fleck.
Lighter 1958 : **28** : No. 4 : 1–4. (Mimeographed).

In tests at the Delhi Tobacco Substation, Ont., all varieties suffered from weather fleck to some extent, although some varieties were less susceptible than others. Five commercial varieties were flecked in increasing amounts in the following order: Delcrest, Jadel, Virginia Gold, Hicks and White Gold. In preliminary observations, *Nicotiana debneyi*, *N. glauca*, *N. noctiflora*, *N. paniculata* and *N. maritima* remained free from fleck.

2937 Drolsom, P. N., Moore, E. L. & Graham, T. W.
Inheritance of resistance to root-knot nematodes in tobacco.
Phytopathology 1958 : **48** : 686–89.

Hybridizations were effected between resistant and susceptible plants of *Nicotiana tabacum*, T1706 being used as a source of root-knot resistance. F_1, F_2, F_3 and back-cross progenies were grown in infested soil in the field and in the greenhouse. The results indicate that either a dominant single gene or a block of genes behaving as a single factor is responsible for resistance to the populations of *Meloidogyne incognita* var. *acrita* from North and South Carolina used in these experiments. In some crosses there were excesses of either resistant or susceptible plants.

2938 Miyamoto, Y.
(The relations between the pathogenicity and antigenicity of tobacco mosaic virus).
Hyogo Noka Daigaku Kenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. 1955 : **2** : 63–68. [Japanese].

The relations between pathogenicity to *Nicotiana glutinosa* and serological behaviour of preparations of the virus subjected to various treatments were examined. Preparations whose pathogenicity had been destroyed by X or ultraviolet irradiation remained serologically active. After moderate treatment with ultrashort waves, heat or alternating currents, both pathogenicity and serological activity were retained. Direct currents, however, rapidly destroyed both pathogenicity and serological activity.

2939 Harada, S., Watanabe, A., Nakayama, A., Sakai, S. & Toyao, T.
(Studies on the frost resistance of tea varieties).
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku : Chagyobu/Bull. Tea Div. Tokai-Kinki agric. Exp. Sta. 1958 : No. 6 : 86–124. [Japanese].

This paper extends the findings of an earlier report [XXVII, 773]. It is noted that differences in frost resistance occur between varieties of similar flushing times. An inverse relation between cold resistance and the water content of the leaves was also found. Some evidence was obtained of intervarietal differences in frost resistance during active shoot development and of an association between autumnal frost resistance and refractive index of the sap.

2940 Ezuka, A.
(Studies on *Exobasidium reticulatum*).
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku : Chagyobu/Bull. Tea Div. Tokai-Kinki agric. Exp. Sta. 1958 : No. 6 : 1–85. [Japanese].
A section in this paper is devoted to varietal resistance of tea in Japan to the above pathogen. The most resistant varieties belong to the Shizuoka and Chugoku [Central Japan] varietal groups.

2941 Carvalho, A.
Preliminary information on the genetics of Ethiopian coffees.
Nature, Lond. 1959 : **183** : Pp. 906.
A report is given of the results so far obtained from a study of Ethiopian coffees at the Instituto Agronómico, Campinas, São Paulo, Brazil. It has been noted that the type known as Erithrean moca is identical with the mutant *semperflorens*, being homozygous for *sf*. Of the 33 plants crossed with Murta (*ttNana*), 23 carried *t*, probably in the homozygous condition. The alleles *tt* characterize Bourbon. The presence of this variety in Ethiopia indicates that this region and not Réunion, as formerly thought, is its place of origin. The variety *typica* (*TTNaNa*) also occurs in Ethiopia. Plants of the *abyssinica* type were frequently found in some seedling populations; they contained *TT*. Other populations segregating for *abyssinica* characteristics possessed *tt*. The type Ennarea or Ennaria does not appear to belong to var. *abyssinica*. Study of the colour of the young leaves revealed that *br* was often present in the introductions. A new recessive allele, *semierecta* (*se*), with a phenotypic effect somewhat similar to the dominant allele *erecta* (*Er*), was detected. The occurrence of the *macrocarpa* type was noted. Seedlings with a small foliaceous and persistent calyx were found in two populations designated S4–Agaro and S6–Cioccie. In spite of having developed sepals, these plants did not carry *sd*. It appears however that *sd* and the allele or alleles responsible for this persistent calyx interact. Other variations affected leaf shape, leaf position on the lateral branches, berry shape and colour, period of fruit ripening and vegetative vigour. The marked variability encountered among the coffees from Ethiopia may be partly a reflection of the choice of conspicuous variants during collection. Possibly a higher amount of natural cross pollination occurring in the native habitat of *Coffea arabica* may also be a cause of the genetic heterogeneity.

2942 Monaco, L. C. & Carvalho, A.
Efeito da giberilina em mutantes de café. **(Effect of gibberellin on coffee mutants).**
Bol. Suptda. Serv. Café, S. Paulo 1958 : **33** : No. 380 : 17–23.
When gibberellic acid at a concentration of 1000 p.p.m. was applied to growing points of the growth mutants *crispa*, *mucronata*, *crassinervia*, San Ramon and São Bernardo, etiolation resulted; the dwarf mutant *nana* was unaffected. Gibberellic acid failed to promote flowering in the plant C790 which at 12 years of age has failed to enter the reproductive state.

2943 Nagel, A.
Découverte d'un nouveau caféier. **(The discovery of a new coffee tree).**
Bull. agric. Congo belge 1958 : **49** : p. 1568.
In the Gola region of Liberia, a single coffee tree was found to have exceptionally high quality and productivity; it is probably a mutant form. The tree is about 10 years old and measures 15 feet in height. The bright red drupes are larger than those of *Coffea robusta* but smaller than those of *C. liberica*; they are oblong in form like those of *C. robusta*. All the fruits ripen at the same time.

2944 Jordán Molero, F.
Especies y variedades de cafetos. **(Species and varieties of coffee).**
Rev. Agric. Puerto Rico 1957 : **44** : No. 2 : 15–58.
Descriptions of morphological characteristics are given for *Coffea arabica* and 12 of its more important varieties, *C. robusta* and three of its varieties, *C. liberica* and five of its varieties, *C. stenophylla*, *C. gilgiana*, *C. divaricata*, *C. brevipes*, 16 minor varieties of *C. arabica* and 23 further species.

2945 Rocha, J. L. V. da
Café Mundo Novo. **(Mundo Novo coffee).**
Bol. Suptda. Serv. Café, S. Paulo 1958 : **33** : No. 380 : 13–16.
An investigation of the frequency of empty locules in selected lines of the above variety grown at the Campinas research station, Brazil, has shown that the incidence of this defect has been reduced to the same level as in the variety Bourbon Vermelho.

2946 Ribeiro Filho, J.
Estudo preliminar sôbre a incidência do "secamento de ponteiros" ou "die back" em algumas variedades de cafeeiro (*Coffea arabica* L.). [**Preliminary study on the incidence of die back in some varieties of coffee (*C. arabica* L.).**
Ceres, Minas Gerais 1958 : **10** : 413–21.

The relative susceptibility of nine varieties to the above disease, which is of uncertain origin, in Viçosa, Minas Gerais, Brazil, was determined. The variety least affected was Mundo Novo LCP379.

2947 A., G. C.
Plant pathological research in Portugal.
Commonw. Phytopath. News 1958 : **4** : 54–55.

A brief account is presented of some of the work in progress at the National Agronomic Station of Portugal. A large collection of strains of the coffee rusts, *Hemileia vastatrix* and *H. coffeicola*, is being used to distinguish differences in susceptibility in host varieties and to differentiate physiological races of the pathogen. Attempts are being made to breed strains of coffee which combine rust resistance with other desirable commercial qualities. Selection for cold resistance is also being carried out.
In addition the diseases of many other economic crops are being investigated.

2948 Dhaliwal, T. S.
Desarrollo de estirpes o biotipos superiores de café mediante la selección, la hibridación y la propagación asexual, para su cultivo en Puerto Rico. (**Development of superior lines and biotypes of coffee by means of selection, hybridization and asexual propagation, for cultivation in Puerto Rico**).
Rev. Agric. Puerto Rico 1957 : **44** : No. 2 : 59–77.

Selections producing high and regular yields have been obtained from local plantations of *C. arabica* and are undergoing progeny tests. The introduced coffees *C. arabica* 'Columnaris' and 'Bourbon' and *C. excelsa* show some promise and are being subjected to selection since they are very variable in yield, regularity of bearing and pathogen resistance. Hybridization work has been initiated and crosses made between *C. arabica* 'Murta', which is highly resistant to *Fusarium bulbigenum* var. *coffeae*, and Puerto-rican material. In breeding for resistance to *Leucoptera coffeella*, *C. stenophylla* and the hybrid Uganda are being used as parents. Attempts to select material adapted to commercial production without shading are in progress. With a view to breeding hybrid varieties, homozygous lines are being developed, either by inbreeding or by chromosome doubling in mutants which appear to have $2n = 22$ instead of $2n = 44$. Methods of vegetative propagation are also under study.

2949 Mora Urpí, J.
Notas sobre el posible origen y la variabilidad del cacao cultivado en la América tropical. (**Notes on the possible origin and the variability of cultivated cacao in tropical America**).
Turrialba 1958 : **8** : 34–43.

Studies of cacao populations in tropical America indicate that variability generally decreases from Mexico to Brazil; all known types are found in Central America but not all occur in South America. These observations, together with historical data, suggest that Central America is the centre of domestication. Many of the Central American forms show, to some extent at least, some of the characters of *Theobroma pentagona* and it is supposed that this species is the oldest form of cultivated cacao and has given rise by mutation, hybridization and geographical isolation to the present local populations.

2950 Conaty, F. N. G. & Smith, M.
Microfermentation of cocoa for selection work.
Malay. agric. J. 1958 : **41** : 39–45.

Details are given of the techniques, devised in connexion with the improvement programme of the Malayan Department of Agriculture, for fermenting and drying single-pod samples of beans, roasting, preparing the "nib" paste, and making and tasting the chocolate obtained from such samples. A multiple microfermentary is used which is essentially an electrically-heated water bath with thermostatic control and a mechanical stirrer. The beans are incubated for 4 days at 35° C. and then for 3 days at 50° C. These times and temperatures have been found suitable for Amelonado and Trinitario cacaos.

2951 Imle, E. P. & Shrum, J. F. (Jun.)
Un centro de cuarentena vegetal para cacao en Florida. (**A plant quarantine centre for cacao in Florida**).
Turrialba 1958 : **8** : 4–12.

This account of the cacao introduction work of the US Plant Introduction Station, Miami, Fla., includes a list of the 91 clones included in the collection up to November, 1957.

2952 Blauwmaanzaad, 1959. (**Poppy, 1959**). Landbouwvoorlichting 16 : Bijl. 43; Ber. Rassenkeuze 1959 : No. 260 : unpaginated.
Varieties tested in the Netherlands since 1946 were Emmabloem [Emma Flower], Nobel and the new variety S.v.P.4, of which the last has shown promise in both yield and seed quality.

2953 Danert, S.
Zur Systematik von *Papaver somniferum* L. (**The systematics of *P. somniferum* L.**).
Kulturpflanze, Berlin 1958 : **6** : 61–88.
A key for identifying varieties of *P. somniferum* from mainly morphological characters is included in this account.

Annual Report of the Department of Hop Research, Wye College 1957 (1958) : Pp. 159.

2954 *Neve, R. A. & Farrar, R. F. Plant Breeding Section. Review of the year's work.* (*pp. 17–21*).
Four English-type seedlings of high *Verticillium*-wilt tolerance have been selected for propagation for farm trials. Several diploid and tetraploid varieties, including a downy-mildew (*Pseudoperonospora humuli*) resistant female, were crossed with wilt-resistant males.

2955 *Darling, H. S., Derbyshire, D. M. & Beard, F. H. Plant Pathology Section. Review of the year's work.* (*pp. 33–40*).
Different parts of the plant of a series of varieties have been tested for resistance to *Pseudoperonospora humuli*. Two seedling families derived from highly resistant female parents obtained from Munich showed marked resistance to infection.
A test to examine the resistance of seedlings at the four-leaf stage was attempted in 1957. From this preliminary work it appears that susceptible seedlings can be eliminated at an early stage of growth.

2956 *Neve, R. A. Inheritance of resin characters in hops. II. Triploid seedlings of Fuggle.* (*pp. 43–49*).
Resin contents of triploid seedlings raised from crosses between tetraploid Fuggle N females and six *Verticillium*-wilt tolerant males were determined. The mean values for each family were higher than for the diploid Fuggle controls. This difference is chiefly a result of the lower seed content in the cones of the triploid plants. Other differences that occur indicate the relative value of the different male parents in transmitting resin characters which appear to be polygenically controlled.

2957 *Farrar, R. F. Seed content of triploid hops: further investigations.* (*pp. 50–59*).
Triploid seedlings of Fuggle have a lower seed content than diploid Fuggle N, but not so low as continental seedless hops. It remains to be seen whether brewers can accept triploids as suitable replacements for continental seedless varieties for lager brewing.

2958 *Beard, F. H. Some new varieties of hops in Wye field plots.* (*pp. 60–81*).
Data on parentage, yield, physical appraisal, resin analysis, cultural details and resistance or susceptibility to *Pseudoperonospora humuli* and other diseases are given for 42 varieties. WFB26, OQ14, WFB145, WFG66, WFH65, AA70, OZ97a and XIII are considered to be the most promising varieties.

2959 *Neve, R. A. Appendix III. Hops for lager brewing.* (*pp. 134–36*).
Breeding varieties suitable for lager brewing has begun. Three clones of Hallertau were treated with colchicine in the hope of obtaining tetraploid material by 1958. This could then be used to produce triploids with the required character of reduced seed content.

2960 Zattler, F.
Über eine Blattbräunung und Blattrollung beim Hopfen im Juni 1958. (**Leaf browning and leaf rolling in hops in June 1958**).
Prakt. Bl. PflBau 1958 : **53** : 115–34.
This disorder occurred in several hop-growing regions of Germany; it was found to be the result of a rapid fall in temperature on the night of 11 June, this being accompanied by a decrease in the humidity of the air. Varieties reacted differently to the cold shock. Hersbrukker Späthopfen [Hersbruck Late hop] and Elsässer Original [Alsace Original] were not affected.

2961 Horner, C. E.
Resistance of hop seedlings to downy mildew.
Phytopathology 1959 : **49** : p. 113. (Abst.).
Hop seedlings showed two types of resistance to *Pseudoperonospora humuli*: (1) resistance to localized disease development on leaves, and (2) resistance to systemic disease development. Crosses differed in ability to transmit resistance to their progeny. There appeared to be some

correlation between Fuggie* (mildew resistant) parentage and resistance to systemic infection.

MINOR CROP PLANTS

2962 Stahl, E.
Chemische Rassen bei Pflanzen mit terpenoiden Inhaltsstoffen. (**Chemical races in plants containing terpenoid substances**).
Pharm. Weekbl. 1957 : **92** : 829–42.
Work on the terpenoid contents of species pertaining to the Araceae, Cannabinaceae, Lauraceae, Myrtaceae, Rutaceae, Labiatae and Compositae is reviewed.

2963 Bhattacharyya, N. K.
Cytology of two species of "Nigella".
Genet. iber. 1958 : **10** : 179–91.
N. sativa and *N. damascena* both have $2n = 12$, nuclei with $2n = 5$, 6, 9, 10 and 17 also being found in *N. sativa*. Minor differences in chromosome morphology have been noted, *N. sativa* having two pairs of chromosomes with secondary constrictions and *N. damascena* three pairs, one of which has three constrictions. The latter observation, together with the fact that *N. damascena* has slightly less heterochromatin than *N. sativa*, suggests that *N. damascena* is evolutionarily rather more advanced than the other species.

2964 Sharma, A. K. & Bhattacharyya, N. K.
Chromosome studies on two genera of the family Piperaceae.
Genetica 1959 : **29** : 256–89.
Information is provided on the morphology of the chromosomes of 10 species and varieties of *Peperomia* and *Piper* collected in India. The following chromosome numbers were determined: *Peperomia argyreia*, $2n = 22$; *P. metallica*, $2n = 22$; *P. pellucida*, $2n = 46$; *P. pellucida* (a variety from the hills), $n = 22$; *Piper nigrum*, $2n = 48$; *P. longum*, $2n = 96$; *P. longum* 'I', $2n = 48$; *P. longum* 'II', $n = 24$; *P. ornatum*, $2n = 80$; and *P. betle*, $2n = 64$.
On the basis of the available cytological data, it is suggested that all the species of *Peperomia*, with the exception of *P. sintenisii* ($2n = 16$), represent a single evolutionary series with a basic chromosome number of $n = 11$.
In *Piper* there appear to be two lines with basic chromosome numbers of $n = 12$ and $n = 16$. The two series are thought to be closely related for they show homogeneity in gross morphology and chromosome structure.
Both polyploidy and structural alterations of the chromosomes have played some part in the evolution of *Piper* and *Peperomia*; in the latter genus the chromatin content of the chromosomes has also changed in the evolution of different species. Variations in chromosome number have been noted in the somatic tissues of individual plants in some species; these variations are also thought to have played an important part in speciation.
The cytological data support the view that *Piper* and *Peperomia* should be placed within the same family.

2965 Angeli, L.
Heterózispaprika termesztési kísérletek. (**Yield trials with heterotic red pepper**).
Kertész. Kutató Int. Évk. 1957 : **2** : 131–40.
At the Horticultural and Viticultural College, Hungary, it was found that hybrids ripen earlier than the parent plants, surpass them in yield and are more resistant to diseases. Hybrid seed production is, however, uneconomical since fruit set in crossed plants is only 28% and only 50–60 seeds per fruit are produced. Emasculation or use of male-sterile lines is necessary since the crop is normally self fertilizing, but open pollination is unsatisfactory because of the lack of insect pollinators. Cece x Tétény, Cece x Magyar hegyes [Hungarian Pointed] and Cece x Elefántormány [Elephant's Trunk] proved to be useful hybrids.

2966 Schutt, K.
Schnellbestimmung von Vitamin C in Paprikafrüchten. (**Rapid determination of vitamin C in sweet pepper fruits**).
Mitt. Klosterneuburg 1958 : **8** : 321–30.
The method described involves extracting the material with metaphosphoric acid in a Turmix apparatus, allowing it to settle for a little while and then titrating with dichlorophenolindophenol solution. Determinations were made using several green and red varieties; the highest values were found in mature red fruits.

2967 Heiser, C. B. (Jun.) & Smith, P. G.
New species of *Capsicum* from South America.
Brittonia 1958 : **10** : 194–201.
It is suggested that the genus *Capsicum* be limited to those species with a pungent, shiny, nonpulpy berry; the description of the genus is amplified to include campanulate as well as

* ?Fuggle.

rotate corollas and entire as well as toothed calyx margins. Two "ulupicas" used as condiments in Bolivia were investigated. One of these was *C. eximium* and the other, which is distinguished by its campanulate corolla, is described as a new species, being given the name of *C. cardenasii*.

Both these species were found to be self incompatible; crosses of sister plants within each species produced fruit containing 8–12 seeds. Ten reciprocal crosses were attempted between *C. cardenasii* and *C. eximium*; the resulting berries contained only one or two seeds. Four hybrids were obtained; these were intermediate in their floral morphology, producing 50–90% stainable pollen. The F_1 plants were self incompatible but some fruit was set in crosses between sister hybrids. Two lines of *C. pubescens*, Ac 1788 and 1789, from Peru were used as the female parents in crosses with *C. cardenasii*. No fruits resulted from 36 crosses with Ac 1789 and only two were set in 20 crosses with Ac 1788; of the 50 seeds obtained from these fruits only 28 germinated. The five hybrids raised were intermediate in most characters except fruit size, which resembled that of *C. cardenasii*. All the F_1 plants showed 90–95% stainable pollen, many fruits being set on selfing; 15 F_2 plants were also highly fertile. The fertility of these hybrids is considered to be remarkable because the parents are dissimilar in many ways; also many interspecific hybrids of this genus show a high degree of F_1 sterility.

Reciprocal crosses were attempted between *C. eximium* and *C. microcarpum*, *C. praetermissum* and several horticultural varieties of *C. annuum* and *C. frutescens*; these crosses were all unsuccessful. Crosses of *C. cardenasii* with *C. praetermissum* produced some seed but only one seed germinated; the seedling died. Seeds were also obtained in crosses of *C. cardenasii* with *C. annuum*, *C. chacoense* and *C. pendulum* but none of the seeds germinated. No fruits were set in crosses between *C. cardenasii* and *C. chinense* or *C. frutescens*.

C. praetermissum from Brazil is a new species, being characterized by dense pubescence and a blue corolla. From crosses with *C. microcarpum* 'C69', two hybrids were obtained, one having 1% stainable pollen and the other 65%; both hybrids yielded some fruits with viable seeds. *C. praetermissum* x *C. frutescens* 'Tabasco' yielded one hybrid with 5% stainable pollen; a few fruits were set. *C. praetermissum* has a chromosome number of $n = 12$.

Brachistus pubescens is transferred to the genus *Capsicum*; it is renamed *C. galapagense*. No fruits were set in attempted crosses with *C. annuum*. From 20 crosses between *C. galapagense* and *C. frutescens* 'Tabasco', 10 fruits were obtained; only one fruit contained seeds and these were nonviable. Also crosses of *C. galapagense* with *C. praetermissum* yielded no viable seed.

2968 Smith, R. W. & Crossan, D. F.
The taxonomy, etiology, and control of *Colletotrichum piperatum* (E. & E.) E. & H. and *Colletotrichum capsici* (Syd.) B. & B.
Plant Dis. Reptr. 1958 : **42** : 1099–103.

A list of varieties of sweet pepper (*Capsicum frutescens*) susceptible to attack by *Colletotrichum piperatum* and *C. capsici* is given. Only one variety of the sweet type is moderately resistant to both, Italian El. The varieties Cascabella and Mexican Chilli are both resistant. Red Cherry is resistant to *C. piperatum* only.

2969 Singh, M. P. & Lala Amarnath
Introduction of improved strains of castor and groundnut in Bihar.
Indian Oilseeds J. 1959 : **3** : No. 1 : 14–18.

A summary is given of the results of trials of (1) 18 groundnut varieties in the three main agricultural regions of Bihar and (2) 16 varieties of castor bean at Sabour.

2970 Singh, D. & Singh, D. N.
New improved varieties of yellow sarson in Uttar Pradesh.
Indian Oilseeds J. 1958 : **2** : No. 4 : 82–86.

Information is given on the performance of Types 1, 10 and 151 of *Brassica campestris*, which have been developed from single-plant selections of local material and show superiority over local varieties in yield and several other respects.

2971 Voskresenskaja, G. S. & Špota, V. I.
(Genetic tumours in distantly related plant hybrids and their utilization in breeding).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1959 : **124** : 195–97. [Russian].

Morphological and anatomical descriptions of the above kinds of deformity in the hybrids *Brassica juncea* x *Brassica oleifera* f. *annua* and *B. juncea* x *B. oleifera* f. *biennis* are given and their occurrence in the F_1 and later generations is discussed in relation to inheritance. Plants with deformed roots in the F_1 of the first-mentioned hybrid amounted to 76·0% and in the F_2 to 52%, the corresponding figures for

the other hybrid being 65% and 25%. The latter hybrid had also a slightly lower percentage of anomalous plants in the F_3 and F_4. Analyses of the segregates with deformed roots showed that more anomalous plants were of the *Brassica juncea* or intermediate types than of the *B. oleifera* type. As might be expected, the F_2 plants with deformed roots gave rise to a higher proportion of such plants in the F_3 than the F_2 with normal roots. Breeding true for morphological characteristics was negatively correlated with incidence of root tumours. Thus, 93·4% of the families that continued segregating had tumours in the F_3 and 73·1% in the F_4; corresponding percentages for the true-breeding families were 15·8 and 23·8. It is suggested that the absence of root tumours should be used in selecting true-breeding types among distant hybrids, especially those of *B. juncea* x *B. oleifera*.

2972 Rai, U. K.
X-ray induced "appressed pod mutant" in *Brassica juncea*.
Sci. & Cult. 1958 : **24** : 46–47.

A mutant with slender, erect siliques appressed to the stem has been induced at the Botany Department, Bose Institute, Calcutta.

2973 Isotalo, A.
Liho-rapsi Pohjois-Suomen rehukasvina. (**Liho rape as a fodder plant in north Finland**).
Maatalous ja Koetoiminta 1957 : **11** : 126–31.

The suitability of the spring rape variety Liho [Fattening] as a fodder crop is discussed and some comparisons mentioned with the variety Regina and the winter rape Matador, over both of which it shows superiority in yield.

2974 Anubhavanarayan
Production of hybrid castor seed in Uttar Pradesh.
Indian Oilseeds J. 1958 : **2** : No. 4 : 92–94.

F_1 hybrids introduced from the USA have not given a satisfactory performance in Uttar Pradesh; it is therefore necessary to develop local hybrids. The F_1 between a 100% pistillate individual and a monecious type showed dominance of monecy. The F_2 segregated in a ratio of 3 : 1 with respect to monecious and pistillate plants. The 100% pistillate character is being maintained by natural sib mating of plants showing this condition with heterozygous monecious plants in an isolated plot. A search is now being made for a maintainer line which, when crossed with the 100% pistillate type, may give 100% pistillate F_1 progeny. That such a search may prove successful has been suggested by the work of Zimmerman and Parkey [cf. XXIV, 3237]. Isolation of such a maintainer would eliminate the need of roguing monecious individuals in the sibbed progeny and would make possible the production of three-way hybrids. Twenty-one lines have been evaluated for combining ability in single crosses. The increase in yield over the higher-yielding parent ranged from 2·7 to 277%, the average increase being about 22·9%. Ten lines have been chosen for the production of single crosses by hand pollination. Crosses are also to be made between lines possessing high general combining ability and the 100% pistillate line. Since it is expected, however, that the latter parent may not combine well, the character of 100% femaleness is being transferred to lines with high combining ability by repeated back crossing. In addition, new inbreds are being isolated and tested for combining ability.

2975 Narain, A.
A corky mutation in castor oil plants.
Sci. & Cult. 1958 : **23** : p. 606.

A mutant characterized by suberization of the stem tissue and a leathery condition of the leaves has been found at the Government Research Farm, Kanpur, UP. Since its suberization offers a means of reducing transpiration, the mutant may prove useful in breeding for drought resistance. The character is being studied genetically prior to an attempt to transfer it to promising types.

2976 Narain, A.
Dehiscence of the fruits of castor plant.
Indian Oilseeds J. 1959 : **3** : No. 1 : 37–40.

The modes of capsule dehiscence in different types of fruits are described on the basis of observations on 100 varieties. Thickening of the wall, endocarp and region of fusion of the loculi was closely related with low amount of shattering. In a cross between the thin-walled shattering variety 4102P and thick-walled non-shattering variety NS1951, shattering was dominant and dependent on two major genes, *P* and *'P'*, the genotypes *PPP'P'* and *ppp'P'* being respectively assigned to the parents.

2977 Aiyadurai, S. G. & Srinivasalu, N.
Some interesting recombinations in inter-varietal crosses in *Sesamum*.
Indian Oilseeds J. 1958 : **2** : No. 4 : 89–91.

Crosses of the high-yielding Indian varieties

TMV2, TMV3 and S1/5 as ♀ parents with the introductions Y6, SC4516 and 158073 from the USA were studied at the Agricultural Research Institute, Coimbatore, Madras. Single-plant selections showing useful combinations of such characters as closely spaced capsules, high number of locules, three capsules per axil, indehiscence and white seeds have been secured.

2978 Mukherjee, S.
Chromosome type (*Sesamum orientale* Linn.).
Indian Oilseeds J. 1959 : **3** : No. 1 : 41–42.

The caryotypes of two varieties of *S. orientale* are described. Although the two caryotypes showed a general similarity, minor differences were found, suggesting that considerable structural alterations in the chromosomes had taken place during differentiation of the varieties.

2979 Kobayashi, T.
Radiation genetics of sesame—Part II. Effects of X-rays on meiotic chromosomes.
Idengaku Zasshi/Jap. J. Genet. 1958 : **33** : 37–45.

Dormant seeds were treated with X rays at a dosage rate of 384·5 r. per min. and doses ranging from 8000 to 12000 r., in order to compare the effects of such exposure with those of P^{32} treatment [1858]. The frequency of chromosome aberrations at metaphase I or anaphase I showed a linear increase with dose, the frequency being higher at the latter stage. The types of aberration induced were in general similar to those resulting from P^{32} treatment.

2980 Singh, D. & Gangwar, L. C.
T. 126, an improved variety of linseed for north-eastern districts of Uttar Pradesh.
Indian Oilseeds J. 1958 : **2** : No. 4 : 87–88.

T126 combines large seed and rust resistance, inherited from its parent T1193–1, with the high yielding capacity of its other parent, T485. In addition, it has early maturity and an oil content of 41·4%.

2981 Khem Singh Gill & Gursham Singh
A study of some yellow-seeded improved strains of linseed for introduction in Kangra Hills of the Punjab.
Indian Oilseeds J. 1959 : **3** : No. 1 : 9–13.

Since yellow-seeded varieties are considered to yield oil of better quality than brown-seeded ones and since the former varieties are preferred by the trade, introduced yellow-seeded varieties were tested against the local improved linseed K–2, which is highly resistant to rust and wilt but brown-seeded. The yellow-seeded varieties gave lower yields than K–2 and were highly susceptible to wilt. In oil content and iodine value, they were superior to K–2. Using the best introductions as regards oil quality, breeding has been initiated to develop yellow-seeded varieties at least equal to K–2 in agronomic characters.

2982 Stefansson, B. R.
A method for estimating the percentage of hybrids in seed-lots of first generation Advance sunflowers by means of a seedling characteristic.
Canad. J. Pl. Sci. 1959 : **39** : 71–74.

Investigations were carried out at the University of Manitoba to explore the possibility of using a seedling characteristic to estimate the percentage of hybrids in seed lots of F_1 Advance, produced by interplanting rows of the inbred S–37–388 and open-pollinated variety Sunrise and harvesting the seed from the inbred. The seedling characteristic chosen was the much more reticulate venation of the leaves of S–37–388, compared with those of Sunrise or Advance. Differences between estimates based on the venation of the first true leaves and those obtained by a reclassification according to mature-plant characteristics did not exceed 4·4% in tests on two naturally cross-pollinated seed lots and one hand-pollinated lot. Estimation of the percentage of hybrids in seed lots of Advance by this method is therefore considered to be practicable.

2983 Wallace, R. H. & Habermann, H. M.
Genetic history and general comparisons of two albino mutations of *Helianthus annuus*.
Amer. J. Bot. 1959 : **46** : 157–62.

A yellow mutant was found in the F_2 of an ultrasonically treated seedling and a white mutant in the F_5. The mutants were grown to maturity by grafting on normal green plants, and set viable seed. The pigment deficiency of each mutant depended on a single recessive gene. When supplied with light at a low intensity, the mutants produced chlorophyll during the seedling stage. The chlorophyll was, however, destroyed under bright illumination, and once it had been bleached, the capacity of chlorophyll production appeared to be lost. When grown under low-intensity illumination, the yellow mutant contained xanthophyll but no carotene and the white mutant neither of these pigments. In general, the grafted mutants resembled normal plants in growth pattern. They were however distinguished by thicker and more

hirsute leaves, greater woodiness and greater resistance to wilting. In addition, the white mutant showed a marked reduction in leaf size.

2984 Obolensky, G.
Production of pollen in different lines of sunflowers and its relation to production of crossed seed.
Qual. Plant. Mater. veg. 1958 : **5** : 64–84.

At the University of Alberta, a series of lines were tested for their pollen production. Random samples of five florets were collected from each of five heads selected at random from each line; to avoid loss of pollen, the florets were collected just before the stigmas protruded. Medi-calgon (sodium hexametaphosphate) was found to be the best medium for microscopic examination and counting of the pollen. The tested lines differed significantly in their pollen production, these differences being maintained over two years. It is concluded that the techniques used are effective for selecting superior pollen-producing lines. It was also found that earliness or lateness does not affect pollen production. In several lines of a German introduction, there was no correlation between the percentage of selfed seed and pollen production. In another experiment, varying proportions of two inbred lines, S–37–388 (female parent) and Sunrise (male parent), were grown together. It appeared that a lower proportion of male plants are required for the production of hybrid seed than that which is commonly used.

2985 Shewfelt, A. L. & Putt, E. D.
A rapid method for estimating the oil content of sunflower seeds.
Canad. J. Pl. Sci. 1958 : **38** : 419–23.

The method described is particularly well suited to assessing breeding material for oil content on account of its speed and applicability to small samples. A sample of a given number of seeds is placed between layers of filter paper and pressed by means of a laboratory hydraulic press. The weight of oil absorbed by the filter paper is then determined. Oil values thus estimated were approximately 73% as high as those obtained by the standard Soxhlet procedure. Analyses of 117 samples by the two methods were correlated by a coefficient of + 0·852.

2986 Morozov, V. K.
(The training of hybrid progenies of sunflower in the south-east).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 5 : 20–25. [Russian].

The effects of different soils and fertilizers and varied moisture supply upon the heritable properties of progenies from three different crosses were investigated at Saratov. The experiments, started in 1947, have not yet been completed, but the results so far available suggest that growing sunflowers on a sandy chernozem without irrigation and fertilizers promotes the development of forms rich in oil. This was the only heritable effect observed. Mention is made of Saratovskij Krupnoplodnyj [Saratov Large-fruited], a new high-yielding variety rich in oil. It was obtained by vegetative-sexual hybridization involving various cultivars and wild sunflowers. It outyields Saratov 10 and Saratov 169.

2987 Schuster, W.
Über Möglichkeiten bei der Züchtung der Sonnenblume (*Helianthus annuus* L.) als Futterpflanze. [**Possibilities in breeding sunflower (*H. annuus* L.) as a fodder plant**].
Z. Pflanzenz. 1958 : **40** : 329–40.

Trials of new strains of sunflower bred for fodder were conducted at the Justus Liebig University in Giessen. Considerable variation was found in both protein and fibre content. The medium-late and late strains with a growth period up to harvesting time of about 75 to 80 days gave much higher yields than the earlier strains.
The most important factors determining a good yield of fodder were found to be: a relatively long growing period, tall habit, a high proportion of leaf in the yield and a low proportion of stem. Branching did not influence either the quantity or the quality of the fodder.
A complex experiment was also carried out with four varieties, three sowing dates and three spacings. With the earlier sowing dates, the late varieties were superior to the earlier varieties but with the later sowings the difference was reduced. During 1957, when weather conditions were particularly unfavourable, the medium-late and late varieties maintained their superiority over the early varieties both when sown early and when sown as a catch crop after winter rape.

2988 Putt, E. D.
Note on differences in susceptibility to *Sclerotinia* wilt in sunflowers.
Canad. J. Pl. Sci. 1958 : **38** : 380–81.

Sunflower varieties previously selected for high and low infection by *Sclerotinia sclerotiorum* were tested in three successive seasons for susceptibility to attack by this organism. On the whole lines selected for low infection retained this property but there were some marked

discrepancies. The lowest average infection was shown by line CM10.

2989 Putt, E. D.
Breeding for rust resistance in sunflowers.
Forage Notes, Ottawa 1957 : **3** : No. 2 : 1–7. (Mimeographed).

Breeding for resistance to *Puccinia helianthi* in Manitoba is surveyed. A single plant (95–388) discovered in 1949 in the open-pollinated F_2 of the natural cross Sunrise x Texas Wild Annual provided the source of the resistance of Beacon, licensed in 1954 [cf. XXVII, 2131]. This variety is a synthetic developed as follows. Since the selfed progeny of 95–388 had the undesirable branching habit of the wild type, plants within this progeny were used as ♂ parents in crosses with S–37–388 and Sunrise (the two parents of the F_1 hybrid Advance) and with five other inbreds. Back crosses and three-way crosses of F_1 plants constituted the starting-point of material tested for rust reaction and other agronomic characters in Chile and also in the greenhouse for seedling response to rust, progeny identity being maintained. Seed from 61 plants representing 26 progenies from seven of the back crosses and three-way crosses was finally obtained and formed the basis of Beacon. The synthetic ripens one week later than Advance and is therefore recommended only for the Red River Valley of Manitoba. It contains about 10% of plants susceptible to rust and is less uniform than Advance.

Field observations have suggested that several genes govern resistance derived from 953–88. Lines pure breeding for at least four different grades of susceptibility have been developed from the initial material. One line has consistently shown infection of less than 1%. Other lines fall into groups having modal classes of (1) 1–5%, (2) 20–40% and (3) 40–70% infection, respectively, according to the season and their parents. Bimodal distribution was evident in some of the progenies of at least four crosses, a satisfactory fit to a 3 : 1 ratio being obtained for segregation of groups (2) and (3), and (1) and (2). The lower infection group was dominant in each case. The F_2 of the cross of the line showing less than 1% infection with the highly susceptible S–37–388 and resistant line 953–102–1–1–22 failed to exhibit any clear modal classes, this result being in contrast to the monofactorial inheritance in 953–102–1–1–22 x S–37–388. The F_2 of the cross of the two above-mentioned resistant lines contained plants with infection up to 15% or much higher than that in either parent, indicating that the genes controlling resistance in the two parents differed. Beacon carries genes for modal classes (1) and (2), the line with less than 1% infection being too late in maturity to be included. In a test of four consecutive generations of Beacon during 1956, yields amounting to 1806, 1927, 2164 and 1931 lbs. per acre were respectively obtained. These results suggest that the procedure of bulking lines and continuing them into the second or third generation to secure maximum yielding ability has merit. The value of such a procedure is being investigated with several groups of inbreds in mixtures or synthetics. The mixtures or synthetics could be reconstituted from the original inbred after two or three generations or when heterosis begins to decline. As already reported, rust resistance has been discovered in five other sources [cf. XXVII, 3365]. The dominant resistance of 953–102–1–1–22 has been incorporated into S–37–388 by back crossing. Resistance from the same source is also being transferred to other inbreds with a view to increasing the potential number of resistant hybrids or synthetics. Finally, the possible value of breeding a synthetic carrying several different genes for resistance or several varieties each possessing a distinct gene for resistance, which could be used according to changes in the racial pattern of the pathogen, is discussed.

2990 Putt, E. D.
Note on resistance of sunflowers to leaf mottle disease.
Canad. J. Pl. Sci. 1958 : **38** : 274–76.

An investigation into resistance of sunflower varieties to *Verticillium albo-atrum* showed that resistance occurs in unrelated lines, is independent of time of maturation and is not genetically linked with rust-resistance genes from the 953–88 source or to those governing expression of symptoms due to aster-yellows virus. One line, CM2, of fairly high resistance is derived from two susceptible varieties. Lines CM6 and CM7 showed the lowest degree of infection in the test.

2991 **New Gila safflower.**
Agric. Res., Wash. 1958 : **7** : No. 5 : p. 15.

Rubis, D. D. & Black, D. S.
Gila, safflower for southwest, is now available.
Progr. agric. Ariz. 1958 : **10** : No. 3 : 8–9.

Rubis, D. D. & Black, D. S.
Gila . . . a new safflower variety.
Bull. Ariz. agric. Exp. Sta. 1958 : No. 301 : Pp. 5.

Developed by the US Department of Agriculture

and Arizona Agricultural Experiment Station, Gila [(N–10 x WO–14) x N–10] is resistant to *Phytophthora* root rot and rust (*Puccinia carthami*) and superior to N–10 in yield, oil percentage and seed weight, N–10 being the chief variety grown under dryland conditions in California. Gila ripens at about the same time as N–10.

2992 Thomas, C. A.
Reaction of safflower varieties to regional collections of *Puccinia carthami*.
Plant Dis. Reptr. 1958 : **42** : 1089–90.

The reaction of several safflower varieties to artificial inoculation by uredospores of *Puccinia carthami* collected in four states is tabulated, and four degrees of intensity, indicated by necrosis and presence of uredia, are distinguished. The results indicate the presence of at least 4 races of the pathogen. Breeding for resistance to all of these appears a possible means of control provided new races do not appear.

2993 Henry, P.
Prolongation de la viabilité du pollen chez *Elaeis guineensis* Jacq. (**Prolongation of pollen viability in *E. guineensis* Jacq.**)
CR Acad. Sci., Paris 1959 : **248** : 722–24.

When kept at temperatures of 0–5° C. and a pressure of 5 cm. mercury, the pollen may remain viable for six months.

2994 Elzinga, G.
Veredelingsproblemen bij enkele kruiden. (**Breeding problems in some herbs**).
StudKring. PlantVeredel., Wageningen 1958 : 780–88. (Mimeographed).

Angelica. In selecting for high content of essential oils in the roots, the ratio of root weight to rhizome weight is estimated by eye after which some of the roots are removed and their essential-oil content determined volumetrically. From previously calculated tables, the total content of all the roots is then estimated. This estimated value agrees closely with values determined more exactly. By means of this method, lines with 0·7–0·8% essential oil in the roots have been selected, compared with 0·3–0·4% for commercial material, and in addition a few individuals with more than 1% have been obtained. Normally, high-content plants lose more oil on drying than low-content plants, so that the dried product is similar in content, but a few high-content plants in which this does not occur have been found. No qualitative differences between the oils of the two types of high-content plants have been detected.

Atropa belladonna. Difficulties in breeding include: (1) the different alkaloid contents of different plant parts; (2) the dependence of alkaloid content upon developmental state of the plant; and (3) the lack of correlation between contents in the first and second years and between contents in mother plant and progeny. The selection method used involves harvesting first-year plants all at the same stage of development and selecting those with the highest content for further study in the second and third years. The induction of tetraploidy has given a significant increase in alkaloid content.

Digitalis purpurea. Heritable differences in glycoside composition have been detected. Chromatographic methods are used in selecting for high contents of individual glycosides. Among induced tetraploid plants, individuals with a high content of each of the three main glycosides digitoxin, gitaloxin and gitoxin have been found.

2995 Hegnauer, R.
Die Bedeutung der chemischen Rassen für die Arzneipflanzenforschung. (**The importance of chemical races in research on medicinal plants**).
Pharm. Weekbl. 1957 : **92** : 860–70.

Problems of characterization and nomenclature of chemical races are discussed and tables are presented listing varieties among wild plants of the following groups: essential-oil plants, alkaloid-containing plants and glycoside-containing plants.

2996 Steinegger, E.
Chemische Rassen bei alkaloidhaltigen Arzneipflanzen. (**Chemical races in alkaloid-containing medicinal plants**).
Pharm. Weekbl. 1957 : **92** : 820–24.

The taxonomic status of chemical races is considered.

It is suggested that the term chemical race should be retained for pure lines, and that for natural cross-pollinating populations the term chemical or physiological form be used. Natural chemical races are regarded as those plants which under the same environmental conditions are quantitatively or qualitatively distinct in alkaloid content but show no differences in taxonomically important external morphological characters. For cultivated races a similar

definition is given except that these should show no macroscopic differences whatever. Examples of both natural and artificial chemical races in various plants are cited from the literature. The status of polyploid races is also discussed.

2997 Quilici, V.
Il contentuto in atropina di *Atropa belladonna* di varie provenienze italiane nell'intento di una selezione di ceppi fisiologicamente più attivi. (**The atropine content of *A. belladonna* of diverse Italian provenance, studied with the aim of selecting strains of higher physiological activity**).
Nuovo G. bot. ital. 1958 : **65** : 16–22.
Samples collected from all over Italy were analysed. In general, the percentage of atropine in the dry matter was *ca.* 0·3%, but three samples, from Alto Metauro in Marche, the Parco Nazionale in Abruzzo and Aspromonte in Calabria, had values of 0·62, 0·65 and 0·58% respectively. These three samples were all from high altitudes.

2998 Matsuo, K., Mizuno, S., Ueno, K., Hirose, M. & Kohayakawa, T.
(**Studies on sex in *Coptis japonica* Makino. I. On the comparison of the sexes and chromosomes in *C. anemonaefolia* var. *dissecta* Yatabe**).
Hyogo Noka Daigaku Kenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. 1954 : **1** : 99–100. [Japanese].
Populations of *C. anemonaefolia* var. *dissecta* consist of hermaphrodite and male plants in roughly equal proportions. Female plants are rare and appear to be variants of the hermaphrodite type. The somatic chromosome number is 18. The content of berberin in male and hermaphrodite plants, 2·39 and 2·42% respectively, is virtually the same.

2999 Dillemann, G.
Les races chimiques chez les espèces cyanogénétiques. (**Chemical races among cyanogenetic species**).
Pharm. Weekbl. 1957 : **92** : 853–60.
After a review of the variation of the cyanogenetic character in *Trifolium repens*, *Lotus corniculatus* and other plants, it is mentioned that by crossing the cyanogenetic species *Linaria striata* with the noncyanogenetic species *L. vulgaris*, an F_1 showing partial dominance for the cyanogenetic character was obtained. Two back crosses to the second parent gave progeny resembling *L. vulgaris* in morphology but including a number of cyanogenetic individuals.

3000 Deshmukh, N. Y.
Chromosome number in neem.
Indian Oilseeds J. 1959 : **3** : p. 45.
The chromosome number of *Melia azadirachta* is $n = 14$.

3001 Matsuo, K., Mizuno, S. & Kohayakawa, T.
(**On the chromosomes of *Stephania cephalantha***).
Hyogo Noka Daigaku Kenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. 1954 : **1** : 97–98. [Japanese].
There are 26 somatic chromosomes, $2n = 24 + XX$ in female plants and $2n = 24 + XY$ in the males. Thirteen bivalents are formed at metaphase.

3002 Institut des Recherches sur le Caoutchouc en Indochine. Rapport Annuel 1957.
(**Institute of Research on Rubber in Indochina. Annual Report 1957**).
1958 : Pp. vi + 199.
Information is provided on breeding work and clonal trials at experimental stations in Viêtnam and Cambodia. Several legitimate and illegitimate seedlings have given good results. In some of the trials, results obtained in previous years have been confirmed [cf. XXVIII, 2055].

3003 **Planting recommendations, 1959-60.**
RRI Plant. Bull. 1959 : No. 40 : 3–10.
RRIM and other clones of rubber recommended for commercial and experimental planting in Malaya are listed, descriptive notes being given on some of them [cf. XXVII, 3373].

3004 Kroll, U.
The breeding of improved pyrethrum varieties.
Pyrethrum Post 1958 : **4** : No. **4** : 16–19.
A survey is given of methods, achievements and problems of breeding in Kenya. So far most seed issues have consisted of two-clonal hybrids. Polycrosses are also being produced chiefly by a system similar to that employed for sugar beet. Six to ten clones are planted in isolation plots and allowed to cross fertilize. The F_1 of each individual plot is then also planted under isolated conditions and seed collected after the

second season from the best types. The F_2 is treated in the same way, so that some line breeding takes place within the various generations of the original polycrosses. After a certain period all the seedlings are mixed and a polycross is made and, after testing, issued to farmers. The breeding plots are however maintained and further roguing effected in each succeeding generation, still further improved seed issues being made biennially. A possible disadvantage of two-clonal crosses is partial or complete incompatibility. The risk of incompatibility is minimized in polycrosses. Number and size of flowers are negatively correlated with flower yield and pyrethrin content; in breeding for higher toxic content a compromise has therefore been necessitated. Breeding for resistance to *Ramularia bellunensis* is receiving attention. Chilling requirement differs between individual plants and between hybrid varieties; some success has been achieved in the production of varieties for the lower altitudes. Apart from the problem of chilling requirement, the depressing effect of higher temperature on pyrethrin content also renders breeding productive varieties with high toxic content for the lower altitudes more difficult than for about 8000 ft. and above. Yet another problem confronting the breeder is the variation in total pyrethrin content and pyrethrin I : pyrethrin II ratio, which often occurs from picking to picking, the true value of a clone or hybrid thus being difficult to assess. Recent chemical investigations have however shed light on the relative efficacy of the separate constituents and production of varieties with predominantly one or other of the pyrethrins for specific insecticidal purposes may require consideration. Sixteen two-clonal hybrids and polycrosses are now on issue [cf. 3005]. The newer hybrids show a marked advance in yield over the older hybrid C1 and local varieties. Finally, attention is drawn to the possible value of polyploids. The attempt to induce polyploids by colchicine has so far been unsuccessful. Natural polyploids have however been discovered, such as the triploids Belgian Congo clone 1353 and Molo clone 3686, both of which excel in flower size and possess a high pyrethrin content.

3005 Kroll, U.
Some new pyrethrum varieties.
Kenya Frmr. : Nov. 1958 : 22–23.

Notes are given describing the performance of 15 varieties recommended for various altitudes in Kenya. Four of the varieties are polycrosses and the remaining 11 single hybrids.

FRUITS AND NUTS

Atti del Congresso Pomologico Internazionale, Firenze 7 ottobre - Ferrara 10 ottobre 1958. (**Proceedings of the International Congress of Pomology, Florence 7 Oct. - Ferrara 10 Oct. 1958**).
Riv. Ortoflorofruttic. ital. 1958 : **42** : 471–770.

The following contributions of interest to plant breeders were included in the papers presented to the congress.

3006 *Morettini, A. Il miglioramento genetico dei fruttiferi in Italia.* (*The genetic improvement of fruit trees in Italy*). (*pp. 482–99*).

After an historical account of the origins of fruit breeding, an outline is given of the main Italian achievements in producing improved varieties of grape, peach, pear, plum, cherry and apple. Special mention is made of the wide range of varieties of grape, peach and pear produced by A. Pirovano. The many peaches bred by the author include a further early peach that ripens soon after Gialla precoce [Early Yellow, cf. XXVIII, 2150]; the wide range of pear cultivars produced both by Pirovano and the author includes an early pear Butirra precoce [Early Beurré] recently released, which ripens 15–20 days before Williams [cf. XXVII, 2161], and another about to be released, William precoce [Early Williams], ripening a few days before Dr. J. Guyot and surpassing it in vigour and quality.

3007 *Souty, J. Il problema della selezione clonale e della moltiplicazione agamica in frutticoltura.* (*The problem of clonal selection and vegetative reproduction in fruit growing*). (*pp. 500–09*).

Observations carried out in France have shown the existence of considerable differences between clones of certain cultivars in respect of vigour of growth, yield and sometimes also in fruit characters; the need for clonal selection for desirable type and freedom from disease both in scion and rootstock is emphasized. The advantages of clonal reproduction of rootstocks are pointed out and some of the more recent improvements in the technique of vegetative reproduction are mentioned.

3008 *Paille, J. & Anquez, Ph. Il carattere particolare della mela "Reinette du Mans" nella Sarthe.* (*The special characters of the apple "Reinette du Mans" in the Sarthe*). (*p. 602*).

Reference is made to the characteristics of this

local apple and measures being taken to improve it.

3009 Murawski, H. & Brauns, M.
30 Jahre Obstzüchtung in Müncheberg. (**30 years of fruit breeding in Müncheberg**).
Dtsch. Gartenbau 1958 : **5** : 327–28.

The breeding of pome, stone and berry fruits had been neglected in Germany before Baur created the Institute for Breeding Research at Müncheberg in 1928. Since that time much work has been done on the breeding of improved varieties, special attention being paid to frost and disease resistance; some of these achievements are listed in this brief account.

3010 Meurman, O.
Uusien puutarhakasvien viljelymahdollisuuksista Suomessa. (**On the possibilities of cultivating new horticultural plants in Finland**).
Maatalous ja Koetoiminta 1956 : **10** : 39–47.

A representative collection of N. American and Canadian fruit trees and berries was made in 1948. These have been tested for use in Finland.

Plum. The diploid species *Prunus nigra, P. americana* and *P. fruticosa* are the hardiest.

Cherry. The cross Sweet English x Vladimir Ottawa shows possibilities.

***Rubus* spp.** Crossing the wild species *R. arcticus* with raspberry varieties has given almost sterile F_1s, but back crosses and subsequent generations have restored fertility, and a few lines have been obtained of raspberry-like plants with the aroma of *R. arcticus* berries.

American highbush blueberry. Varieties June, Rancocas, Atlantic and Pemberton flourish where soil conditions are suitable.

Grape. The hardy varieties Beta and Fredonia can be cultivated in southern Finland.

Föreningen för Växtförädling av Fruktträd, Balsgård. Verksamhetsåret 1957. (**Association for Fruit-tree Breeding, Balsgård. Working year 1957**) : 1958 : Pp. 24.

3011 *Nybom, N. & Bergendal, P.-O. Kärnfrukter och bärbuskar.* (*Pome fruits and bush fruits*). (*pp. 7–12*).

Mutation experiments. Apple and pear trees have been irradiated with neutrons, X rays and γ rays. Seeds of apple, blackberry and gooseberry have also been irradiated and the use of ethylene oxide and other substances as mutagens is being investigated. Chromosome size has been found important in determining tolerance of chronic radiation in a cobalt field.

Apple. The crosses Gyllenkroks Astrakan x Persikerött Sommeräpple [Peach-red Summer apple] and Worcester Pearmain x Gyllenkroks Astrakan, known to give good progeny, have been repeated on a large scale [cf. XXVIII, 2080]. Crosses made for the production of winter apples include Lobo x Ivöäpple, McIntosh x Kaiser Wilhelm, Oretorpsrenett [Oretorp Reinette] x Cortland, Cortland x tetraploid seedlings from Rött Järnäpple [Red Iron apple], Ingrid Marie x Spartan and Ingrid Marie x Ivöäpple. Ingrid Marie has also been crossed with the English variety Houblon [Hop]. Cortland has been used as mother plant in crosses with scab-resistant material from Germany and the USA. Fruit set in most crosses was rather low. Two promising new varieties have been obtained from Transparente Blanche [White Transparent] x Rött Ananas [Red Pineapple] and Ingrid Marie x Filippa. The first ripens earlier than Transparente Blanche and has fine bright red fruits with a pleasant slightly acid flavour. The second has red fruits good in flavour, ripening during December-February; the fruits show no cracking round the calyx and the flesh does not readily become discoloured in air.

A seedling from Blenheim has proved to be tetraploid, one from Cox's Orange x Åkerö has been found to be triploid, and it has been confirmed that the early American variety Close is triploid. Of the commonly grown varieties, Laxton's Superb, Filippa and Dronning Louise [Queen Louise] have been found to yield the best juice; in Jonathan and Cox's Pomona, an extremely low content of malic acid is a recessive character; and it appears to be possible to identify and rogue undesirable seedlings on the basis of low acid content in the leaves. Low acidity is not associated with low vitamin-C content.

Vegetative shoots of Cortland, Lobo, Ingrid Marie and others have been treated with colchicine.

Pear. Older crosses which have given good progeny have been repeated, including Doyenné de Juillet x Clapp's Favourite, Clapp's Favourite x Conference and Clapp's Favourite x Colorée de Juillet. Tetraploid Fertility has been crossed with tetraploid Williams. A large-fruited variety with soft, succulent flesh and a fine aroma has been obtained from Clapp's Favourite x Colorée de Juillet; it ripens in early September.

Small fruits. Preliminary studies of contents of dry matter, acids and anthocyanins in black

currants are in progress. Inbred lines of black currants and raspberries are being maintained.

3012 *Oldén, E. J. Stenfrukter, jordgubbar och grundstammar.* (*Stone fruits, strawberries and rootstocks*). (*pp. 12–15*).

Apple. Hybrids of *Malus baccata* with cultivated varieties have an extensive and finely branched root system which appears to develop well in poor soils. Their use as rootstocks for cultivated varieties is being investigated.

Plum. Crosses of diploids, hexaploids and sloe in various combinations have been effected. Self-fertile varieties of European plum generally crossed more readily than self-sterile forms with diploid plums. Among varieties being used in breeding are Early Laxton, Ruth Gerstetter, Persikeplommon [Peach plum], Jefferson, Reine Claude d'Oullins, Tuna and Wilhelmina Späth. In tests of hardiness the best varieties were Allmänt Gulplommon [Common Yellow plum], Bonne de Bry, Mount Royal, Mälar, Reine Claude Stor Grön [Large Green gage], Rivers Early Prolific, Russian Green Gage and Tuna. Tetraploids have been obtained from crosses between hexaploids and diploids, and one pentaploid from diploid Beauty x hexaploid Reine Claude d'Oullins has been found. Progeny from diploid x tetraploid crosses mostly had 24 chromosomes but one plant had 32.

Cherry. Among Bigarreau varieties, 55 cross combinations have been effected, the chief aim being the development of late-ripening, large-fruited and firm-fleshed varieties. The crosses include Van Bigarrå [Van Bigarreau] x Geneva types and combinations of Schneiders Späte [Schneider's Late], Noir de Guben [Guben Black], Stor Svart Bigarrå [Large Black Bigarreau] and other late varieties as well as Bing and Schreckens Bigarrå [Schrecken's Bigarreau]. Among some cherry crosses, Ostheimer, Körösi Meggy [Körös mahaleb], and Brysselska Bruna [Brussels Brown] have been used as parents. *Prunus avium* types with doubled chromosome complements have been crossed with sour cherries. *P. fruticosa* and *P. avium* have been crossed in order to test the hypothesis that these two species form the progenitors of the common sour cherry.

Strawberry. Jucunda, with calyces which are easily removed, and Valentine, which has very firm flesh, are being used as parents in numerous crosses, together with Finn, Carolina Superba, Fairfax, Senga Sengana, Sparkle, Weserruhm and Ydun.

3013 Pieniążek, J.
Instytut Hodowli Roślin Owocowych w Balsgård (Szwecja). [**The Balsgård Fruit Breeding Institute (Sweden)**]. Postępy Nauk Roln. 1956 : **3** : No. 6 : 93–97.

The work of the above institute is outlined with special reference to the induction of mutants and to the work on polyploid apples and pears.

3014 Yeager, A. F. & Meader, E. M.
Breeding better fruits and nuts.
Sta. Bull. NH agric. Exp. Sta. 1958 : Bull. No. 448 : Pp. 24.

Apple. The progeny from a cross of Winter Banana x McIntosh has been studied; one seedling, NH 8, has been propagated to a limited extent for further testing. This seedling is a late regular-cropping variety; the firm red fruits are the same shape and size as those of Winter Banana and have some of the flavour of McIntosh; they keep well throughout the winter in cold storage. Six other seedlings of the same cross are being further investigated; one has bright firm fruits of medium size; they are red in colour and resemble those of Jonathan in flavour.

A seedling from a cross of Northern Spy with Macoun has produced fruits resembling those of Macoun in colour and shape but the fruits are much larger than those of Macoun. The fruit is crisp and of good keeping quality. This seedling has shown a tendency towards alternate bearing.

Part of a McIntosh tree producing giant fruits was found to be tetraploid; the tetraploid flowers were pollinated by Winter Banana pollen, many fruits being set. In the greenhouse, 97% of the seed germinated; all the seedlings tested were found to be triploid with three exceptions. The triploid progeny is rather variable, some trees being weak and others vigorous. Only a few of the seedlings have so far produced fruit, although many have blossomed. Many seedlings from open pollination of the tetraploid flowers of McIntosh were raised; some seedlings showed strong growth. Progeny are also being studied from a cross of 4*n* McIntosh x 4*n* Wrixparent.

Breeding for resistance to apple scab is also under way in cooperation with stations in other states. Some seedlings having McIntosh in their parentage have not been attacked by scab.

Pear. One of the principal aims in pear breeding is to produce a variety whose ripening season follows that of Clapp's Favorite. Several promising selections were obtained from a cross between Clapp's Favorite and Beurré Baltet. NH2 has large, spindle-shaped fruits of high

quality and light russet colour; these fruits ripen soon after those of Clapp's Favorite but it is difficult to tell exactly when to gather the crop in order to avoid a breakdown of the flesh near the core of the fruit. The tree of NH2 is semi-dwarf with wide-angle crotches to the branches; it is suggested that this selection might make an excellent filler tree for orchards. The original selection has cropped regularly; it has now been propagated for further testing. Another seedling, NH4, is unusually tall and upright; the large green fruits are smooth and keep well until midwinter. This selection has been later in coming into bearing but is nevertheless considered to be worth further investigation.

Many other hybrid seedlings were also studied.

Cherry. Belle Magnifique [Magnificent Beauty], which originated from a cross between a sweet and a sour cherry, produces fruit of high quality in New Hampshire but the yield is rather low. This variety was grown among varieties of sweet and sour cherries; seedlings obtained by open pollination under these conditions were extremely variable. They included weak and vigorous trees, some of these latter being tall, others dwarf. In a controlled pollination trial, Belle Magnifique set some fruits in a cross with sweet cherry but pollination by sour cherry was unsuccessful.

Flowers of the wild black cherry were emasculated and pollinated with pollen collected from the Capulin cherry in Ecuador. A small number of seeds was obtained, two of which germinated after stratification. These seedlings grew into vigorous trees, flowering for the first time in 1957; no fruits were set. It is not yet known whether or not the trees are true hybrids.

Peach. The breeding of the varieties Sunapee and Meredith is described [cf. XXV, 3363 and XXVI, 1745, respectively]. Another seedling of the same parentage as Sunapee is noteworthy for its early ripening. A peach bud-sport found on a cross between Eclipse and a white-fleshed peach from North Caucasus is also described [cf. XXVII, 843]. Two separate bud sports were found on a seedling tree of a cross between Oriole and the white-fleshed Caucasian peach; the sports yielded white-fleshed nectarines. These fruits were of good quality and flavour but were not large enough for the sports to be worth propagating as commercial varieties. Hardy peaches including a white-fleshed seedling from Minnesota have been crossed with yellow selections. Also Nectarcrest, a white-fleshed nectarine, was crossed with hardy yellow peaches; some of the F_1 fruits were of fine eating quality.

Walnut. Seed from hardy English walnut trees was collected and seedlings grown; these have not yet fruited. A cross was effected between *Juglans sieboldiana* and *J. cinerea* and back crosses made to *J. cinerea*. The F_1 hybrid bore a few fruits when only four years old; it bore only pistillate flowers. The hybrid is vigorous and not subject to leaf disorders.

Chestnut. Nuts collected from trees growing in Seoul, Korea, have produced seedlings which mostly seem to be *Castanea crenata*. These seedlings have been tolerant of *Endothia parasitica* under conditions of severe testing; they produce sweet well-filled nuts of good eating quality. The Korean chestnuts require a relatively frost-free site. Another chestnut designated NH3 has shown resistance to blight, although it is not immune; it is probably descended from an introduced tree of the Korean type. NH3 has unusually large good-quality nuts.

Hybrids between American and oriental chestnuts are being studied, some vigorous trees having been obtained.

Hazel. Open pollinated crosses between American hazel and European filbert have been effected. The hybrids show great variability but some are worthy of propagation. Some selections have a flavour superior to that of the European filberts.

Almond. Seedlings are being studied which originated from open pollination of the variety Hann; the Hann trees were growing among various peach varieties and selections. The seedlings are extremely variable. *Amygdalus nana*, which grows into a bush three feet high, was crossed with almond. Of the many seedlings produced only one survived. The buds of this hybrid are more hardy than those of peach; it produces pollen but the pistils abort. The hybrid may perhaps be used for introducing greater hardiness into almonds.

Raspberry. The breeding of the variety New Hampshire is described [cf. XXVI, 237]. Success is a purple raspberry orginating from a cross between the black raspberry Morrison and NH100; the latter is an F_2 selection from the cross Taylor x *R. chamaemorus*. Success produces medium to large purple berries; the flavour is very good in fresh, frozen and canned fruits. This variety is also noteworthy for its high productivity, hardiness and easy culture. It is resistant to *Didymella applanata* but is not immune to anthracnose.

An extremely early strain of *R. pungens* var. *oldhami* from Korea, when crossed with black raspberry, yielded partially sterile F_1 plants

which bore garnet-coloured fruits. Most of the F_2 generation was of little value but seed from a few of the more promising seedlings was grown to produce an F_3 generation. Some productive and rather hardy F_1 plants were gained when the red raspberry Taylor was pollinated by *R. pungens* var. *oldhami*. The F_2 population was extremely variable. Some seedlings produced attractive large fruits ripening in the second half of June; one selection bore rather tart red fruit which made a good preserve. These hybrids may be useful for introducing extra-early ripening into cultivated varieties. Crosses were made with some ever-bearing raspberries.

Attempts are being made to breed varieties ripening fruit on the new canes in midsummer, when ordinary raspberries are fruiting on the overwintered canes. Such early fruiting has been found in descendants from the cross *R. odoratus* x Durham but these seedlings were not good enough to be used as commercial varieties. Early fruiting on new canes also occurs in a red raspberry named Summer Red and in *R. chamaemorus* and *R. arcticus*. Selected plants with this character have been crossed with other raspberries, the aim being to produce a variety in which overwintering of the canes is not necessary for good cropping. Such a variety might be less susceptible to cane diseases, for these might not be carried over to the new shoots.

Reciprocal crosses have been made between Durham raspberry and *R. odoratus*; of 25 F_1 hybrids, all were sterile except one which produced a few mature drupelets. This plant has been used in various crosses with equal success as either the male or female parent. Some promising selections were obtained from crosses with the New Hampshire red raspberry. A cross between Taylor and *R. morifolius* yielded no valuable progeny but when Hailsham, a tetraploid red raspberry, was crossed with *R. morifolius*, the resulting triploid hybrid was almost good enough to introduce as a variety. An F_2 generation bred by open pollination appeared to be diploid. The plants were mostly sterile; they were extremely variable, showing characteristics of both species. Back crosses to New Hampshire raspberry gave a good progeny but the seedlings showed hardly any characteristics of *R. morifolius*.

A progeny of purple raspberries resulted from a cross between the black raspberry Morrison and the red raspberry Durham. One purple-fruited seedling ripening in the autumn was back crossed to the black raspberry; the resulting hybrid produced fruit similar to that of the black raspberry and ripening rather early in the autumn.

Blackberry. New Hampshire 1, which originated from a cross between L6, a variety from the NY Experiment Station, and Snyder has been distributed to a limited extent. It is hardy and productive of large berries. Geneva 32, a NY variety of high quality, was crossed with a nearly thornless wild blackberry. The hybrid seedlings are hardy and partially sterile; it is presumed that they are triploids. The variety New York 32 was pollinated with pollen from a triploid hybrid originating from a cross between tetraploid Hailsham raspberry and *Rubus morifolius*. Some of the complex hybrids are hardy; the fruits look like blackberries.

Fairly hardy self-fertile F_2 progenies were obtained from a cross between the diploid blackberry Early Harvest and selected nearly thornless wild blackberries thought to be *R. canadensis*. Succeeding generations are to be grown; it is hoped that an improved early variety will be found. Early Harvest has also been crossed with the red raspberry and the black raspberry *R. occidentalis*; both of the resulting F_1 generations were male sterile. Some seeds were obtained by open pollination and a small F_2 generation of Early Harvest x black raspberry was raised; these plants are partially self fertile. Some of the hybrids appear to be promising breeding material. Early Harvest was also pollinated by pollen from *R. idaeus* x *R. arcticus*. The F_1 generation of this cross is variable, plant height ranging from a few inches to four feet. These seedlings show a high degree of male sterility, no self-pollinated fruits being produced. Viable seed has been obtained from the complex hybrids by open pollination and also in the greenhouse, using pollen from red raspberry, the New Hampshire 1 blackberry, *R. canadensis* and the partially fertile hybrid of *R. odoratus* x Durham raspberry. Early Harvest x *R. pubescens* also yielded a male-sterile F_1 generation, an F_2 being obtained by open pollination. Diploid *R. odoratus* crossed with a tetraploid of the blackberry Snyder yielded triploid hybrids; fertile plants were obtained when the chromosome number was doubled by colchicine treatment. The fruit of these plants is purple and adheres tightly to the plant. The plants are nearly thornless.

Blueberry. Controlled crosses were made between superior varieties of the northern highbush species *Vaccinium corymbosum* and selected plants of wild *V. lamarckii*, a lowbush species. The aim is to produce a variety with large light-blue berries and a round-topped bush two

feet tall; such a bush could be protected from winter damage by either a natural covering of snow or a mulch of straw. F_1 hybrids had the desired height but all the F_1 plants of Pemberton x lowbush and Atlantic x lowbush had unsatisfactory fruit, this being small to medium in size and dark in colour; also none of the F_2 bushes had the desired combinations of fruit characters. A few F_2 bushes were retained; these included types which readily produce stolons.

V. constablei, a hexaploid highbush species having light blue berries of fine flavour borne on stoloniferous bushes, crossed readily with F_1 hybrids of Pemberton x lowbush. Some of the complex hybrids yielded small berries of light blue colour and fine flavour; these berries were firmer than those of northern highbush x lowbush. Also some of these hybrids showed good stolon formation.

F_1 hybrids of Pemberton x G–5 lowbush were back crossed to the cultivated highbush varieties Earliblue and Bluecrop. More bushes bearing blue fruit occurred among the back-cross progenies than in the F_2 Pemberton x lowbush; considerable variation in height was found among the back-cross progenies.

Two wild bushes of *V. corymbosum* were selected for their winter hardiness. One of these selections named Sebatis probably has some lowbush in its ancestry. A large number of seedlings were raised from the cross Coville x Sebatis; Coville is a cultivated variety resembling Sebatis in being able to withstand temperatures of — 20 to — 25° F. The hybrids were marked by variability in habit and other characteristics; some of the plants produced firm berries of fine flavour.

Selected hybrids were retained for further testing in respect of hardiness. Coville showed susceptibility to *Calyptospora columnaris*.

Sebatis was also crossed with several other varieties. Seedlings of Sebatis x Berkeley produced unsatisfactory berries of small size but some Sebatis x Bluecrop seedlings yielded firm berries of good colour and good flavour. Earliblue x Sebatis was also a promising cross.

The other winter-hardy wild selection, East Clarendon 1, was also crossed with Earliblue; most of the seedlings had unsatisfactory fruit, only one blue-fruited seedling being selected.

Breeding for earliness in highbush blueberries is also in progress. Some of the progeny from crosses between Earliblue and Bluecrop produced large blue fruits of high quality. The hybrids varied in their maturity period. One seedling began to ripen before Earliblue; it also possesses other desirable characters. Various selections from this cross are to be further tested. Some seedlings from Earliblue x USDA 11–104 were outstanding for the flavour of their fruit but in some cases the berries were rather soft. Other crosses of Earliblue with cultivated highbush varieties are also being investigated.

Strawberry. The variety Blaze originated from the cross (Simcoe x Pathfinder) x (Tupper x Fairfax). It has perfect flowers and medium to large bright-red berries which are rather rounded; they ripen in midseason. The rather soft berries require careful handling, they are not suitable for freezing on account of their light internal colour. Blaze is a productive variety, having produced 15,000 quarts per acre in trials in Massachusetts; leaf spot is not often a serious problem with this variety. The plants are strong, having large crowns and producing many runners.

Strafford, from the cross (Simcoe x Catskill) x (Tupper x Fairfax), also has perfect flowers and yields large deep-red berries. The fruit begins to ripen 10 to 14 days after Howards 17.

The parents of Jamboree, another new variety, are a pistillate seedling of the field strawberry *Fragaria virginiana* and Catskill. The berries are intermediate in size between those of wild and cultivated plants; the fruit has the much desired flavour of the wild parent. This variety is vigorous and produces large clusters of fruit which ripens early; the fruit is very good for making jams and jellies and for freezing.

A late-ripening pistillate selection from the cross Tupper x Fairfax was crossed with Fairpeake, a variety of high quality. The resulting hybrids included several late-ripening plants with perfect flowers. One of these named Merrimack produces high-quality fruits; the berries are of a glossy bright-red colour with a tough skin and some of the sweet flavour of Fairfax. Merrimack is considered to be suitable for the commercial market.

Grape. Breeding for early maturity is in progress. In variety trials, Erie, which produces good quality blue fruit, was found to be the earliest; it is however male sterile. Progenies obtained by open pollination of Erie yielded some seedlings with perfect flowers and early maturity.

3015 Brooks, R. M. & Olmo, H. P.
Register of new fruit and nut varieties. List 13.
Proc. Amer. Soc. hort. Sci. 1958 : **72** : 519–41.

A further annotated list of varieties of fruits and

nuts introduced by official and commercial agencies in North America is provided [cf. XXVIII, 3318].

3016 Zeller, O.
Über die Jahresrhythmik in der Entwicklung der Blütenknospen einiger Obstsorten. (**The yearly rhythm in the development of the flower buds of some fruit varieties**).
Gartenbauwiss. 1958 : **23** : 167–81.

Observations on the development of the flower buds in several apple and pear varieties and a cherry grown at the Horticultural Institute at Stuttgart-Hohenheim are presented. Each variety was found to have its own particular rhythm of development. Varieties differed in the date when differentiation of the flower primordia began in summer and also in the date when development was renewed after the winter resting period.

3017 Schneider, G. W., Walker, D. R. & Correll, F. E.
A controlled temperature chamber for hardiness studies with young fruit trees.
Proc. Amer. Soc. hort. Sci. 1958 : **72** : 23–26.

"An inexpensive (approximately $525) temperature control chamber large enough to study hardiness of entire young trees is described. The temperature controls permit simulation of field conditions by making it possible to hold a constant temperature or to increase or decrease temperature continually or intermittently and at constant or changing rates of temperature change for a given run. The equipment permits automatic control for up to 7 days and for any length of time by resetting."
[Authors' summary].

3018 Henze, J.
Untersuchungen über den Kohlenhydrat-Eiweiss-Haushalt der Rinde in seiner Beziehung zur Frostresistenz von Obstgehölzen. (**Investigations on the carbohydrate-protein metabolism in the bark and its relation to the frost resistance of fruit trees**).
Z. Bot. 1959 : **47** : 42–87.

These investigations, conducted at the Institute for Fruit Cultivation of Bonn University, were carried out with apple, peach and plum varieties growing on various rootstocks.
A negative correlation was found between water content and frost resistance. Also during hardening, the nitrogen content of the bark was found to rise; Cox's Orange, the most susceptible of the apples tested, showed the lowest total nitrogen content.
Pentose sugars and in particular arabinose, were found to be important for frost resistance. A complex of arabinose and a polypeptide was found; the content of this complex was directly related to the frost resistance in the apple varieties. Three ways in which pentoses may have a protective action against frost are suggested.

3019 Neumann, D.
Beiträge zur Gewinnung obstbaulicher Leistungszahlen. Die Wuchs- und Ertragsleistung von Apfelsorten im VE Lehr- und Versuchsgut Eschenhörn. (**Contributions to the obtaining of numerical data on performance in fruit cultivation. The growth and yield performance of apple varieties in the VE Teaching and Research Station, Eschenhörn**).
Dtsch. Gartenbau 1958 : **5** : 324–25.

Tabulated data on the performance of a large number of varieties are presented.

3020 Klein, L. G.
The inheritance of certain fruit characters in the apple.
Proc. Amer. Soc. hort. Sci. 1958 : **72** : 1–14.

The results of a study of 14 crosses between commercial varieties at the New York State Agricultural Experiment Station are reported. All varieties were heterozygous for genes for fruit size, Jonathan, Macoun and Golden Delicious being more nearly homozygous for small fruits than McIntosh, Monroe, Red Spy and Grimes Golden, which appeared to transmit both large and small size with equal propensity. Cortland, Wagener, Ben Davis, Yellow Newtown and Yorking (York Imperial) tend to impart factors for large fruit to many of their progeny, Ben Davis, in particular, being noteworthy in this respect. Data from all the crosses suggested that small size was dominant over large. Factors for round to oblate fruit appeared to be dominant to those for oblong to conical fruit. Wagener, Jonathan, Macoun, Cortland and Monroe tended to give progeny with round to oblate fruit, while Ben Davis, Golden Delicious, Yorking and Yellow Newtown tended to transmit factors for oblong to conical shape. From a study of fruit colour the following conclusions were drawn. Red is dominant to green or yellow. Red striping is apparently dominant to a blush or washed type of coloration. In McIntosh x Jonathan, McIntosh x Ben Davis,

Macoun x Red Spy, Jonathan x Yorking, Red Spy x Wagener, Jonathan x Yellow Newtown and Golden Delicious x Jonathan, a 3 : 1 ratio was obtained for red striping to red blush + green or yellow. Not all crosses between red-striped varieties, however, segregated according to a 3 : 1 ratio. Macoun may possess a single gene responsible for the dull dark appearance of the fruits of many of its progenies. Red Spy, with a uniform washed type of red coloration, gave rise in several combinations to progenies with typical Northern Spy striping. This result suggests that the mutation responsible for Red Spy has not affected the subepidermal layer of cells of the apical meristem giving rise to the germ cells. Genes responsible for sweetness appeared to be recessive to those for acidity. It was however extremely difficult to assess the tendency of varieties to transmit either character. Objective chemical tests are required for flavour evaluation. Many highly acid segregates were found in the progenies of Cortland x Wagener and Red Spy x Monroe. Quality also was difficult to study genetically since, like flavour, it depends on several component properties. Except in Cox's Orange Pippin x Esopus Spitzenberg, seedlings as high in quality as the better parent were unusual. Varieties tending to transmit high quality were Cox's Orange Pippin, Esopus Spitzenberg, Red Spy, Golden Delicious, Macoun, Jonathan, Yellow Newtown and possibly Monroe. McIntosh, Wagener, Yorking and Gallia Beauty produced only a limited number of high-quality progeny, while segregates from crosses involving Ben Davis, Cortland and Grimes Golden were mostly fair to low in quality.

3021 Murawski, H.
Beiträge zur Züchtungsforschung beim Apfel. III. Phänologische, morphologische und genetische Studien an F'_2-Sämlingen einer Kreuzung zwischen *Malus zumi* mit Kultursorten. (**Contributions to breeding research in apple. III. Phenological, morphological and genetical studies on F'_2 seedlings of a cross between *M. zumi* and cultivated varieties**).
Züchter 1958 : **28** : 297–309.

In Müncheberg, the inheritance of various flower and fruit characters was analysed in (Gelber Bellefleur [Yellow Bellflower] x *Malus zumi*) x Jonathan and (*Malus zumi* x Gelber Bellefleur) x Wintergoldparmäne [Winter Golden Pearmain]. The hybrids inherited genes for early flowering from *M. zumi*. Also several other characters of *M. zumi* showed marked dominance in the F_1 and F_2; these characters included some of horticultural importance, such as time of ripening, keeping quality and fruit size. All the characters studied were inherited in a complex manner, being under the control of polygenes. The type of fruit coloration occurring in Jonathan also showed dominance.

3022 Gollmick, F.
Beobachtungen an *Malus*-Artbastarden I. (**Observations on interspecific hybrids of *Malus*. I**).
Arch. Gartenb. 1958 : **6** : 359–82.

At the Phytopathological Institute at Naumburg, some taxonomic characters were studied in interspecific crosses of *Malus* in order to determine whether these characters would be useful in the analysis of hybrids of unknown parentage.

In the *Sorbomalus* and *Chloromeles* sections of the genus, the two halves of the leaf on either side of the midrib were found to be bent slightly towards each other in the bud forming V and U shapes respectively; this type of vernation is described as angular. The *Eumalus* section showed quite different vernation, this being involute; variations of the involute vernation were found amongst different species.

Hybrids between parents with angular and involute vernation tended to have the former type, which appeared to be more or less completely dominant over the involute type. More than one genetic factor seemed to control vernation, for the interspecific hybrids showed a continuous series of intermediate types of vernation.

These studies gave no information on the origin of cultivated apples for the possible ancestors, *M. prunifolia* and *M. baccata*, belong to the *Eumalus* group and like the cultivated species have involute vernation. However crab apples descended from *Eumalus* species could be distinguished from American crab apples derived from *Chloromeles* species.

The inheritance of lobate leaf form, which is a characteristic of the *Sorbomalus* group, was studied in crosses of *M. toringo* with various species. Many of the hybrid seedlings had lobed leaves on the long shoots; in some cases lobed leaves were also found here and there on the short shoots. In order to find out whether the wild species with unlobed leaf margins used in these crosses had recessive genes for the lobate character, the crosses *M. prunifolia* x *M. floribunda* and *M. floribunda* x *M. baccata* var. *genuina* were studied; only seedlings with unlobed leaf margins were found among the progenies. Of all the crosses, only combinations

of *M. toringo* with *M. sargenti*, *M. floribunda* and hybrids of *M. toringo* had the lobed leaf character as strongly expressed as in *M. toringo* itself. It is thought probable that *M. floribunda* belongs to the section *Sorbomalus*. The results also indicated that the lobate leaf character is controlled by more than one hereditary factor.

The leaf of *M. floribunda* has marginal teeth of a characteristic pointed form. Interspecific hybrids of *M. floribunda* were found also to have pointed teeth and it is thought that this character may be of some use in hybrid analysis. The average number of styles per flower in 42 cultivated varieties and 21 wild species and the range of variation of this character in 13 crosses were determined. In the F_2 generations, variation increased, indicating that style number is under polymeric control.

M. fusca was characterized by a particularly low style number. Hybrids of *M. baccata* and *M. prunifolia* had average style numbers lower than those of cultivated varieties; it therefore seems improbable that mid-European apple varieties originated from *M. baccata* and *M. prunifolia*.

3023 Nybom, N.
Vad fordras av en modern äpplesort? (**What is required of a modern apple variety ?**).
Sverig. pomol. Foren. Årsskr. 1958 : 91–108.

In this general review of the characters required in apple varieties the degrees to which these requirements are fulfilled by older varieties and by recent varieties developed in European countries and the USA are surveyed.

3024 (**The apple variety Desertnoe Petrova**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 1 : p. 54. [Russian].

Desertnoe Petrova [Petrov's Dessert], bred at the Moscow Horticultural Research Station from Koričnoe Polosatoe [Brown Striped] x White Winter Calville, has reached an advanced trial stage. It crops profusely and ripens in August. The fruit is of medium size or large and has tender, fragrant, sweet flesh.

3025 Cireaşă, V.
Soiuri autohtone de măr din depresiunea Ozana-Topoliţa. (**Local apple varieties in the Ozana-Topoliţa depression**).
An. Lucrăr. şti. Inst. agron. Ion Ionescu de la Brad Iaşi 1957 : 107–15.

Pomological notes on 12 local varieties are given. These varieties are of interest on account of high yield and resistance to cold and diseases. It is suggested that their quality could be improved by crossing with standard commercial varieties.

3026 Milu, M.
Soiuri autohtone de măr din centrul pomicol Comarna, regiunea Iaşi. (**Local apple varieties in the Comarna fruit-growing centre of the Iaşi region**).
An. Lucrăr. şti. Inst. agron. Ion Ionescu de la Brad Iaşi 1957 : 117–22.

Eight local varieties are described. Their desirable characteristics include high yield, longevity, resistance to cold, drought and diseases and good keeping quality. The variety Viesti has a satisfactory flavour for use as a dessert variety.

3027 Kallio, T. K.
Suomessa viljeltyjen omenapuulajikkeiden pölytyssuhteista. (**On the pollination relationships of apple varieties cultivated in Finland**).
Maatalous ja Koetoiminta 1956 : **10** : 65–73.

Apple varieties commonly grown in Finland have been tested and data are given for percentages of fruit set and ripened, and for number of seeds when open-pollinated, self pollinated or crossed with other named species. Self pollination produces little or no fruit, Wealthy and Syysjuovikas [Autumn Striped] being to a small degree exceptional in this respect. Cross incompatibility is rare except in closely related varieties. Pollen germination experiments showed poor pollen viability in Sariola, Gallén and Sokeri-Miron [Sugar Miron].

3028 Jamalainen, E. A.
Omenalajikkeiden varastoimiskokeet v. 1952–1955. (**Storage experiment with apple varieties in the years 1952-55**).
Maatalous ja Koetoiminta 1956 : **10** : 174–85.

Extensive data are given for a large number of apple varieties on keeping qualities, retention of flavour and succulence, and susceptibility to attack during the storage period. The longest keeping varieties over the three-year experimental period were Linda, Lobo and Åkerö; others keeping well till February or longer were Cellini, Firecide, Kirkniemen talvi and Niemelän. *Gloeosporium* rot was the most serious disease in storage.

3029 Rootsi, N.
Några bedömningsgrunder för fruktkvalitet hos äpple. (**Bases for the evaluation of fruit quality in apple**).
Sverig. pomol. Foren. Årsskr. 1958 : 139–47.

The total loss in weight due to peeling and coring is greater in large apples than in small but the relative loss in weight is less in the former, the following correlations being found: between total weight and weight of peel 1 mm. in thickness, — 0·877, and between total weight and core, — 0·58. The mean weight of peel removed represents 10·1% of the total weight, and contains 40–50% of the total ascorbic acid. Correlation coefficients between ascorbic acid content and fruit size were — 0·77 for Cox's Orange and — 0·61 for Ribston. Mean dry-matter content is about 14%, extreme values being 10 and 20%; the value is generally lower for summer apples than for winter apples. Different refractometric readings were obtained for different varieties. Determination of specific weight is useful since it allows fruit weight and air content per volume to be estimated. Air content affects the structure of the fruit flesh and the keeping quality of the fruit and shows a strong negative correlation with specific weight.

3030 Nybom, N.
Preliminära resultat från försöken med "natural apple juice" vid Balsgård. (**Preliminary results from tests with natural apple juice at Balsgård**).
Fruktodlaren 1958 : **29** : 129–31.

In tests of six apple varieties at Balsgård, Sweden, McIntosh was best in juice quality, followed by Ingrid Marie and Ribston [cf. XXVIII, 4614].

3031 Borisoglebskij, A. D.
(Vladimir Mihajlovič Krutovskij. On the occasion of the 20th anniversary of his death).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 12 : 64–65. [Russian].

Mention is made of six winter-hardy small-fruited apple varieties bred by V. M. Krutovskij, a pioneer in Siberian horticulture.

3032 ten Houten, J. G.
Resistance trials against collar rot of apples caused by *Phytophthora cactorum*.
Tijdschr. PlZiekt. 1958 : **64** : 422–31.

In tests conducted at Wageningen, Netherlands, differences in virulence among isolates of the pathogen were observed. Host selectivity occurred among the pathogen strains, but this effect was small compared with those of the differences in virulence and the intervarietal differences in resistance. Resistance showed some intravarietal variation but was generally of the same order within any one variety. Among 80 varieties and 8 rootstocks tested with three isolates, the most resistant were James Grieve, Dubbele Zoete Aagt [Double Sweet Aagt] and Dubbele Bellefleur [Double Bellflower], and EMIX, EMIV and EMVII.

3033 Nagy, P.
Metaxénia vizsgálatok néhány körtefajtánál. (**Metaxenia investigations on some pear varieties**).
Kertész. Kutató Int. Évk. 1957 : **2** : 261–80.

The varieties Arabitka, Arpával érő [Ripening with Barley], Bosc, Nyári Kálmán [Summer Kálmán], Pap, Olivier Serres, Téli esperes [Winter Esperes] and Vilmos [Williams] were used in crossing experiments at Budapest in 1955. Statistical analysis of quantitative morphological characters showed that metaxenia often occurred, the influence of the pollen parent varying for the different morphological properties. The degree of metaxenia was influenced also by the mother plant.

3034 Mitu, M.
Soiuri autothone de păr din centrul pomicol Comarna. (**Local pear varieties in the Comarna fruit-growing centre**).
Lucrăr. şti. Inst. agron. Ion Ionescu de la Brad Iaşi 1958 : 287–91.

Pomological notes on 13 local varieties are presented. The desirable characteristics of these pears include resistance to frost, drought, *Fusicladium* and insects, high yield and longevity. The varieties Busuioace, Sîntilieşti, Cetăţui, Cîntari and Lucii-galbene [Yellow Lucii] are of good dessert quality.

3035 Cireaşă, V.
Soiuri autohtone de păr din masivul Ghindăoani. (**Local pear varieties of the Ghindăoani massif**).
Lucrăr. şti. Inst. agron. Ion Ionescu de la Brad Iaşi 1958 : 293–300.

Pomological descriptions are given of 10 local varieties out of the 21 known from this region. The desirable characteristics shown by these varieties include high yield, longevity and frost resistance. The variety Ghinăoani, which

bears fruits of good quality, is recommended for wider distribution.

3036 Hiroe, I., Nishimura, S. & Sato, M.
(Pathochemical studies on *Alternaria kikuchiana*. On toxins secreted by the fungus).
Tottori Nogaku Kai Ho/Trans. Tottori Soc. Agric. Sci. 1958 : **11** : 291–99. [Japanese].

Data are provided on the relative susceptibilities of a series of Japanese pear varieties and two introduced forms. Susceptibility to the fungus was correlated with the sensitivity of the leaf to phytoalternarin A, one of the toxins secreted by the fungus.

3037 Blumer, S.
Der Zwetschgenrost. **(Plum rust).**
Schweiz. Z. Obst-. Weinb. 1959 : **68** : 26–30.

Tabulated information is provided on the susceptibility to *Tranzschelia pruni-spinosae* of some plum varieties investigated at Wädenswil, Switzerland. Three varieties of *Prunus triflora* appear to be completely resistant.

3038 Scaramuzzi, F.
Contributo allo studio delle cultivar locali italiane di ciliegio acido. **(Contribution to the study of the local Italian cultivars of sour cherry).**
Riv. Ortoflorofruttic. ital. 1959 : **43** : 34–51.

The first part of this article gives a definition of the characters used in describing 12 cultivars of sour cherry studied at Florence.

3039 Santesson, B.
Fertilitetsförhållanden hos tetraploid *Prunus avium*. **(Fertility conditions in tetraploid *P. avium*).**
Sverig. pomol. Foren. Årsskr. 1958 : 109–20.

A spontaneous tetraploid and two colchicine-induced tetraploids designated 3010 and C164*x* were studied. Fruit set after open pollination was low, being 0–1·3% in the spontaneous tetraploid, 0% in C164*x* and about 5% in 3010. In the first two, low fertility appeared to result from both failure of fertilization and arrested seed development after fertilization, while in the last infrequent fertilization was the chief cause. In each tetraploid, haploid pollen was more effective than diploid in fertilizing the ovules. The spontaneous tetraploid and 3010 proved fertile when used to pollinate sweet, sour and Duke cherries and tetraploid *P. avium*.

3040 Zielinski, Q. B.
Some factors affecting seed germination in sweet cherries.
Proc. Amer. Soc. hort. Sci. 1958 : **72** : 123–28.

In view of the problem of securing sufficiently high rates of germination in sweet-cherry breeding, investigations on the above were carried out at the Oregon Agricultural Experiment Station, using the early-ripening variety Royal Ann and late variety Lambert. In general, the latter showed a much higher rate of germination than Royal Ann, the importance of variety as a factor thus being indicated. The following treatment proved the most satisfactory for germinating large quantities of seeds: stratification of seeds removed from the fresh, fully mature fruit in sphagnum moss at alternating temperatures of 35 and 41° F. for 120 days and planting in the field in mid-November.

3041 Fogle, H. W.
Effects of duration of after-ripening, gibberellin and other pretreatments on sweet cherry germination and seedling growth.
Proc. Amer. Soc. hort. Sci. 1958 : **72** : 129–33.

The effects of the above treatments were studied at the Irrigation Experiment Station, Prosser, Washington State, in connexion with the breeding programme. A treatment consisting of 2–4 months of afterripening in the stones at 37° F., followed by soaking of the excised kernels in 100 p.p.m. gibberellin solution for 24 hr., is considered to offer promise as a means of reducing storage loss and making germination possible during the same season as that in which the seed is produced.

3042 Barg, T.
Cytologische Untersuchungen an Sauerkirschen. **(Cytological investigations on sour cherries).**
Gartenbauwiss. 1958 : **23** : 200–08.

Sour cherries differ greatly in their reproductive behaviour, some being self sterile and others partly or completely fertile. In order to find the cause of self sterility, cytological investigations were made of some cherries growing at the Horticultural Institute in Weihenstephan.
The self-sterile variety Köröser Weichsel [Körös Morello] was found to have many PMCs with 16 bivalents; others showed various numbers of univalents, trivalents and quadrivalents during diacinesis and metaphase I. The quadrivalents formed rings more frequently than chains. In anaphase I, the bivalents separated normally but some of the univalents were lost or formed

micronuclei. Also the separation of the quadrivalents was frequently irregular; some lagging chromosomes were eliminated or formed micronuclei either singly or in groups. Most tetrad cells were similar in size and form but in some cases two large and two small tetrad cells arose from the same mother cell, indicating an unequal distribution of the chromosomes. It was not possible to determine whether or not hypoploid tetrad cells could form fertile pollen.

Several other varieties of sour cherry showed cytological behaviour similar to that of Köröser Weichsel but they vary in respect of self fertility. It is concluded that in these varieties pollen with an abnormal number of chromosomes is either fertile or forms such a low proportion of the total pollen that it cannot be responsible for self sterility.

Langsurer Prachtweichsel [Langsur Splendour Morello] rarely showed cytological abnormalities such as those of Köröser Weichsel but some quadrivalents were observed. It is thought that further investigation is required in order to determine whether or not self sterility has a cytological cause in varieties such as Langsurer Prachtweichsel.

Doktorkirsche [Doctor cherry], an amarelle cherry, showed more quadrivalents than the previously mentioned varieties and correspondingly fewer bivalents; where trivalents were found, they were accompanied by a corresponding number of univalents. Irregular distribution of chromosomes at anaphase I led to the formation of cells with various chromosome numbers and the tetrad cells varied in size. This variety had more micronuclei than the other varieties. Also syndiploid PMCs were frequently observed whereas these were rare in Köröser Weichsel. Some of the syndiploid cells did not complete both stages of meiosis so that hexads were formed. This variety has been described by some workers as being self fertile and by others as partially self fertile.

External factors which may influence fertility are discussed and the probable interspecific origin of sour cherries is considered as a possible cause of self sterility. Sour cherries may have inherited sterility genes from both *P. fruticosa* and *P. avium*. In such a case various combinations of sterility genes would occur in sour cherries. Partial sterility could arise in self-fertile forms as a result of the formation of hypoploid tetrad cells, which do not form fertile pollen, or through defects in the chromosomes such as the loss of some genetic material. In these semisterile cherries, meiosis must show a high degree of abnormality in order to reduce fertility to about 50%. Suggestions are made for further investigations of this question. Semi-sterility is chiefly found in the amarelle group of cherries.

3043 Oldén, E. J.
Växtförädling av körsbär vid Balsgård. (**Cherry breeding at Balsgård**).
Sverig. pomol. Foren. Årsskr. 1958 : 47–60.

Investigations on fruit colour indicate that red skin is generally controlled by a dominant factor, although in some crosses, e.g. Frogmore x Napoleon, two factors seem to be involved. The varieties Erianne, Noir de Guben [Guben Black], Napoleon, Late Black and Stor Svart Bigarrå [Large Black Bigarreau] have proved to be heterozygous for the factor determining albinism. In the cross Heinrichs Riesen [Heinrich's Giant] x Stor Svart Bigarrå, various degrees of chlorosis as well as albinism were found, indicating that more than one factor was involved. Susceptibility to gummosis was generally low among the progeny of Frogmore and Schreckens, high among those of Allmän Gulröd [Common Yellowish Red], Early Rivers and Annonay and fairly low among those of Erianne, except where the latter was combined with Allmän Gulröd or Napoleon. The combination Heinrichs Riesen x Schreckens was particularly good, giving 84% plants with very low susceptibility.

Breeding aims include disease resistance, earliness, hardiness, good quality and resistance to damage during transport. The crossing techniques employed involve the use of emasculation and embryo culture. The varieties most frequently used as parents are Schreckens for its size and earliness, Frogmore for its resistance to gummosis and Napoleon and Allmän Gulröd for their quality. Two vigorous seedlings from Dönnissens Gula [Dönnissen's Yellow] x Allmän Gulröd proved to be triploid ($2n = 24$). *Prunus fruticosa* has been crossed with a tetraploid *P. avium* male parent to test the theory that sour cherry is derived from a hybrid of these two. Promising seedlings with dark-red fruits have been obtained from Annonay x Early Rivers, Annonay x Allmän Gulröd and Heinrichs Riesen x Napoleon, the first being early and the other two particularly good in quality.

3044 Natividade, J. V. & Coelho, J. M. N. S.
Novas variedades Portuguesas de pessegueiros. (**New Portuguese peach varieties**).
Bol. Jta. nac. Frutas, Lisboa 1956 : **16** : 7–13.

Descriptions are given of the following eight

varieties: EA2–50 [open pollinated seedling of EA261–45 (J. H. Hale x Triumph)], an early peach with good transportability and melting aromatic flesh; EA68–50 [J. H. Hale x EA9–42 (J. H. Hale x Amsden)], an early yellow-fruited variety; EA31–50 [Fr. Bernardo de Brito x EA140–44 (Fr. Bernardo de Brito x Earliest of All)], a form with a whitish-cream skin with a deep red flush and sweet aromatic flesh; EA158–45 and EA163–45 (both from J. H. Hale x Triumph), varieties with maturation date intermediate between those of the parents and bearing fruits with melting aromatic flesh; EA47–50 [J. H. Hale x EA2–42 (J. H. Hale x Fr. Bernardo de Brito)], a form in which the fruits are of especially attractive appearance, being yellowish-orange veined with red to give a marbled effect; EA117–50 [J. H. Hale x EA44–44 (J. H. Hale x De Alcobaça)], a variety with firmer fruits than those of J. H. Hale and better transportability; and EA72–45 (De Alcobaça x Triumph), an early yellow clingstone variety with very firm flesh.

3045 Morettini, A.
Le cultivar di pesco per i frutti sciroppati. (**Peach cultivars for preserving in syrup**).
Riv Ortoflorofruttic. ital. 1959 : **43** : 3–18.

The clingstone peaches with firm flesh, of the type known as Cotogna in Tuscany and Percoca in Naples, have been found the most suitable for preserving in syrup. Brief descriptions are given of 18 cultivars of this type, some of them being local Italian varieties and others introductions from the USA. Indications are given of the origin of each variety and of its main properties. By a suitable combination of varieties it is possible to have a supply of ripe fruit from the middle of July to the last week in September, the first to ripen being Coronado, Vesuvio and Fortuna and the last Terzarola gialla [Yellow Terzarola]; all the later ones suffer excessive attacks from *Puccinia prunispinosae* and from *Ceratitis capitata*. The cultivars most recommended are Vesuvio, Fortuna, Gaume, Vivian, Ricciona and Coronado. A recently produced seedling of Vesuvio, which has been named Precocissima di Francia [Earliest of France], is also recommended as it ripens 10–15 days before Vesuvio.

3046 Morettini, A.
Le varietà di pesco per i frutti sciroppati. (**Peach varieties for canning in syrup**).
Ital. agric. 1958 : **95** : 831–39.

[Cf. 3045.]

3047 Cochran, L. C. & Pine, T. S.
Present status of information on host range and host reactions to peach mosaic virus.
Plant Dis. Reptr. 1958 : **42** : 1225–28.

All peach and nectarine varieties are equally susceptible to infection by peach-mosaic virus, but differ in the severity of symptoms. On the basis of inoculation experiments, a comprehensive list of varieties has been drawn up, divided into three categories according to their reaction. The clingstone varieties on the whole are tolerant in comparison with the severely damaged freestone types.

3048 Mota, F. S. da
Os invernos de Pelotas, RS, em relação às exigências das árvores frutíferas de fôlhas caducas. (**The winters in Pelotas, Rio Grande do Sul, in connexion with the requirements of deciduous fruit trees**).
Bol. téc. Inst. agron. Sul 1957 : No. 18 : Pp. 38.

The flowering dates of a series of locally grown peach varieties were determined in order to ascertain their relative dependence on winter chilling.

3049 Hu, C.-C.
(**The history of citrus fruits in China**).
Chung-hua Nung-hsueh Hui Pao/J. agric. Ass. China 1956 : **14** : 54–61. [Chinese].

A synopis is given of the history of citrus-fruit cultivation, the dates of introduction into cultivation, source of supply and some of the principal varieties being indicated.

3050 Ohta, Y. & Furusato, K.
Polyploidy and heteroploidy in *Citrus* seedlings.
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1957 : No. 8 : 37–48.

About half of the seedlings obtained from open-pollinated seeds of Natsudaidai [Summer orange] were aneuploids, about two-thirds having $2x + 1$ and the remainder $2x + 2$. Mixoploidy was frequently detected within single root tips. Only one plant with $2x + 3$ was found. The seedlings had slender leaves and poor growth, often failing to survive. The possible relations between aneuploidy and polyembryony require investigation.

3051 Furusato, K. & Ohta [Ota], Y.
(**A note on seedless *Citrus* forms**).
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1957 : No. 8 : 100–02. [Japanese].

Parthenocarpic fruit development has been

observed in the following: Fukure mandarin, Hassaku [First Day of the Eighth Month], Shiki [Four Seasons] mandarin, Kawahata mandarin, *C. grandis* x *Poncirus trifoliata*, Kunembo and Natsudaidai [Summer orange]; in the last case, parthenocarpy was induced by hormone treatment [cf. XXVII, 3825].

3052 Mukherjee, S. K. & Cameron, J. W.
Tree size and chromosome number in a trial of tetraploid trifoliate orange as a citrus rootstock.
Proc. Amer. Soc. hort. Sci. 1958 : **72** : 267–72.

Seedlings of tetraploid ($2n = 36$) and diploid ($2n = 18$) strains of *Poncirus trifoliata* have been studied as rootstocks for several varieties at the University of California Citrus Experiment Station, Riverside. Considerable variability has been observed in tree size within scions on both types of rootstock. No evidence has been obtained that aneuploidy is contributing to the variability in the case of the tetraploid. The occurrence of euploid gametic seedlings, instead of nucellar seedlings, or some degree of diploid-tetraploid incompatibility may be responsible for the variability. Several pairs of chromosomes in the tetraploids had secondary constrictions and satellites.

3053 Ohta, Y. & Furusato, K.
Embryoculture in *Citrus*.
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1957 : No. 8 : 49–54.

Addition of vitamin B_1 (0·01 p.p.m.) and vitamin C (0·01 p.p.m.) to White's solution without sugars at pH 6 was advantageous in the culture of the larger embryos from open-pollinated seeds of Natsudaidai [Summer orange]. Addition of 2,4,5-T, but not of α-naphthalene acetic acid or 2,4-D, had some effect in promoting growth.

3054 Fang, C., Yeh, M.-Y., Ong [Weng], M.-T., Li, C.-S. & Li, L.-Y.
(Studies on changes in quality in citrus fruits during ripening at Foochow).
Fu-chien Nung-hsueh-yuan Hsueh-pao/Fukien agric. J. 1957 : No. 6 : 57–68. [Chinese].

This investigation included a comparative study of fruit quality in local orange and mandarin varieties. Data are provided on fruit weight, juice content, soluble material, total acids, ascorbic-acid content and pH.

3055 Sawano, M.
(On the storage and longevity of the pollen of *Poncirus trifoliata*).
Hyogo Noka Daigaku Kenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. 1954 : **1** 90–92. [Japanese].

Optimum germination conditions were a 20–30% sucrose-agar medium and 25–30° C. Pollen remained viable for 110 days when stored in a desiccator over $CaCl_2$.

3056 Li, L.-Y., Chou, C.-Y. & Hung, T. S.
(Natural conditions in the pomelo-growing areas of Punan, Fukien, varieties and methods of cultivation).
Fu-chien Nung-hsueh-yuan Hsueh-pao/Fukien agric. J. 1957 : No. 6 : 39–54. [Chinese].

Descriptions are included of the seven principal varieties grown in the above region and their breeding potentialities are briefly considered.

3057 Omčikus, Č. & Blagojević, M.
Neka zapažanja o simptomima mozaika na raznim sortama smokve u Hercegovini. **(Some observations on mosaic symptoms of different fig varieties in Herzegovina).**
Zaštita Bilja 1957 : No. 44 : 27–34.

The main types of fig mosaic virus which have been observed on fig varieties at Mostar are described, varietal differences in resistance being noted. The writers recommend selection of resistant biotypes only among high-quality varieties, whose fruits can be eaten fresh or dried. Bjeluša [White] and Zlatna Smokva [Golden fig] are mentioned as varieties of this kind.

3058 Lombardi, P. L.
Cultivar di *Morus alba* e *M. nigra* esistenti nella stazione agraria sperimentale di Ascoli Piceno. **(Varieties of *M. alba* and *M. nigra* existing in the agricultural experimental station of Ascoli Piceno).**
Ann. Sper. agr. 1958 : **12** : No. 6 : Suppl. lxiii–lxx.

Though all the cultivars in the collection, 50 in number, produce the same development of silkworm larvae, differences in certain other features have been observed; thus the Japanese variety Kauroso is highly resistant to *Septogloeum mori* and the varieties Philippine and Lhu produce cocoons with a lower yield of silk. Brief descriptions are given of each of the cultivars in

the collection, together with photographs of the leaves.

3059 JARRETT, F. M.
Studies in Artocarpus and allied genera, I. General considerations II. A revision of Prainea.
J. Arnold. Arbor. 1959 : **40** : 1–37.
These are the first papers of a series concerned with revisions of *Prainea, Artocarpus, Pararto-carpus* and *Hullettia*.

3060 NANDI, D. L.
Chemical constituents of different varieties of mangoes (*Mangifera indica*).
Sci. & Cult. 1958 : **23** : 618–19.
Varietal differences in chemical composition of the fruit chiefly affected total acidity, total sugar, carotene and vitamin C. Of the seven varieties analysed, Langra was noteworthy for its high content of vitamin C (176 mg./100 g.).

3061 TANI, T.
(On the characteristics of *Gloeo-sporium kaki* in culture and inter-varietal differences in the develop-ment of lesions and in sporulation on kaki fruits infected by this fungus).
Kagawa Nogyo Semmongakko Kenkyu Hokoku/Tech. Bull. Kagawa Agric. Coll. 1956 : **8** : No. 1 : 115–20. [Japanese].
Varietal differences in susceptibility to the above fungus and in production of conidia are recorded.

3062 PUHTINSKIJ, JU. E.
(The walnut in the province of Voronež).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 12 : p. 53. [Russian].
A local form from Šutkino from which seedlings are being raised is described. It is winter hardy and flowers late in the spring, which enables it to withstand late frost. It yields well each year, and particularly well every other year. The nuts ripen in October. They weigh 8 g. each, having a kernel percentage of 42·5% and thin shells.

3063 SEMENOV, N. I.
(Valuable forms of the walnut for the Black Sea Littoral).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 12 : 50–52. [Russian].
Descriptions are given of Lipniki 123, Aibga 67, Aibga 173, Estonian 3, Estonian 29, Krasnaja Poljana 44, Medoveevka 31 and Kavkazskaja Bomba [Caucasian Bomb], which have been selected from trees in different districts along the Black Sea Littoral. They are better adapted to local climatic and soil conditions than introduced cultivars, surpass the latter in nut quality, are resistant to pests and diseases, and produce regular high annual yields. Most produce large nuts and Kavkazskaja Bomba very large ones weighing up to 23 g. Aigba 173 is protandrous, and Medoveevka 31, Estonian 3, Estonian 29 and Lipniki 123 are protogynous.

3064 VERESIN, M. M.
(Expand the area under nuts).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 12 : 46–49. [Russian].
Mention is made of winter-hardy walnuts selected in the Ukraine, the seedlings of which overwinter well at Voronež, and also of wild forms of hazel found in the provinces of Voronež and Tambov; the latter are highly productive and the nuts are equal or superior in quality to some cultivars.

3065 STREBKOVA, A. I.
(Productive forms of pecan).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 12 : 53–54. [Russian].
In the course of a study of pecans conducted by the Institute of Plant Industry, some trees on which ♂ and ♀ flowers ripened at about the same time and thereby ensure high regular annual yields of nuts have been selected. A tree of an unidentified variety from Adler and another belonging to the variety Texas from Soči, both producing high quality nuts, are described. A number of seedlings have been raised.

3066 SAWANO, M.
(The chromosome number of the Japanese chestnut).
Hyogo Noka Daigaku Kenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. 1955 : **2** : p. 32. [Japanese].
An examination of root-tip cells showed the chromosome number to be $2n = 24$.

3067 OZBEK, S. & AYFER, M.
An hermaphrodite pistacia found in the vicinity of Antep, Turkey.
Proc. Amer. Soc. hort. Sci. 1958 : **72** : 240–41.
Two trees with ☿ flowers are described. They may be seedlings of *Pistacia vera* or *P. vera* x *P. terebinthus*. The former possibility appears however to be more likely. They are less fruitful than standard varieties. Their value as self-fruitful pollinators and in breeding a good-quality variety with this dual role is to be investigated.

3068 Raman, V. S.
Studies in the genus *Arachis*. V. Note on 40-chromosomed interspecific hybrids.
Indian Oilseeds J. 1959 : **3** : No. 1 : 46–48.
Three F_1 hybrids ($2n = 40$) from crosses of *A. hypogaea* as ♀ with two unidentified wild species are described. All the hybrids exhibited pronounced heterosis. Unlike *A. hypogaea* x *A. monticola* [cf. 696], these hybrids did not bear pods appreciably reduced in size. Each produced a higher number of two-seeded than one-seeded pods. At diakinesis $2_{IV} + 2_{III} + 13_{II}$ were frequently observed in all three hybrids. The multivalents may not have been an indication of structural differences between the parental genomes, since all the parents form 1_{IV}.

3069 **New Virginia peanut attracts attention.**
Crops & Soils 1959 : **11** : No. 6 : 20–21.
Developed at the Tidewater Research Station Holland, Va., and released in this state during 1958, Virginia 56R has surpassed all other varieties in yield when grown on a wide range of soil types. Classed as a Virginia runner type, it matures a few days earlier than Jumbo runner varieties and requires earlier harvesting to avoid excessive shedding. In shelling percentage and proportion of extra large kernels it averages 70% and 36% respectively.

3070 Srinivasalu, N. & Chandrasekaran, N. R.
A note on natural crossing in groundnut, *Arachis hypogaea* Linn.
Sci. & Cult. 1958 : **23** : p. 650.
Two pure lines, AH698 with spreading habit and rose-coloured seeds and AH4226 with the bunch habit and red seeds, were used in an experiment at the Agricultural Research Station, Tindivanam, Madras. The dominant characters of spreading growth and red seeds served as markers. Natural crossing occurred to the extent of 0·99%, and was slightly higher in the spreading type than in the bunch type.

3071 Mishra, S. P.
Correlation studies in groundnut.
Indian J. Genet. 1958 : **18** : 49–53.
The relationships between seed size and leaf characters have been studied separately in spreading and erect types. It was found that, with the use of an empirical equation for the estimation of seed size in terms of leaf characters, partial regression coefficients provided a more definite indication of the relationships than total correlation coefficients alone. In the case of spreading varieties, an increase of 1 cm. in leaflet length corresponded to an increase of about 0·395 gm. in seed weight, and an increase of 1 cm. in leaflet breadth was associated with a decrease of about 0·598 gm. in seed weight. About 61% of the variation in weight was associated with variation in leaflet length and breadth. Length : breadth and length x breadth were not correlated with seed weight. In the case of the erect types, an increase of 1 cm. in both leaflet length and breadth corresponded to an increase in seed weight of about 1·105 and 1·031 gm. respectively, while an increase of 1 $cm.^2$ in the factor length x breadth corresponded to a decrease of about 0·311 gm. These three factors were associated with 72% of the variation in seed weight. The regression of seed weight on length : breadth was not significant.

3072 Umali, D. L. & Bernardo, F. A.
Notes on mutant forms among Philippine plants. III. Plicate-leafed coconut tree.
Philipp. Agric. 1958 : **42** : 323–24.
Mutant trees bearing plicate leaves with fused leaflets are described.

3073 Satyabalan, K.
Coconut varieties of the Laccadive Islands.
Bull. Indian cent. Cocon. Comm. 1958 : **12** : 303–06.
The performance of varieties introduced from the above islands and under trial at the Central Coconut Research Station, Kasaragod, India, is described. They possess some desirable features, such as high yield, regular bearing, high rate of spathe production and higher oil content of the copra than the ordinary tall variety of the west coast. They are being used in hybridization at the station.

3074 'Abd-ul-Jabbar Al-Bakir
(Date palms and their origin).
Majallat Zira'at 'irak./Quart. Mag. Iraq. Agric. 1957 : **12** : 213–44. [Arabic].
The fossil, archeological and historical evidence concerning the possible origin of date palms is examined.

3075 Bamonte, A.
L'oliva ascolana. **(The Ascoli olive).**
Ital. agric. 1958 : **12** : 851–77.
The noted table olives of Ascoli, in the Piceno province of Italy, are described, many classical allusions to them being noted.

3076 Umali, D. L. & Bernardo, F. A.
Notes on mutant forms among Philippine plants I. A case of green santol (*Sandoricum koetjape* Merr.).
Philipp. Agric. 1958 : **42** : p. 141.

The occurrence of a tree bearing fruits which remain green when ripe is reported. In other respects the tree is similar to the normal type.

3077 Umali, D. L. & Bernardo, F. A.
Notes on mutant forms among Philippine plants II. Seedless avocado (*Persea americana* Mill.).
Philipp. Agric. 1958 : **42** : 194–95.

Three trees have been found which produce both seeded and seedless fruits, in a ratio of about 2 : 1. The seedless condition is probably due to embryo abortion.

3078 Jinno, T.
Cytogenetic and cytoecological studies on some Japanese species of *Rubus* II. Cytogenetic studies on some F_1-hybrids.
Idengaku Zasshi/Jap. J. Genet. 1958 : **33** : 201–09.

Crosses involving the following species were attempted: *R. trifidus*, *R. hirsutus*, *R. ribisoideus*, *R. palmatoides*, *R. fauriei*, *R. wrightii*, *R. phoenicolasius*, *R. parvifolius*, *R. sieboldii* and *R. pectinellus*. In all these species $2n = 14$, with the exception of *R. sieboldii* ($2n = 28$) and *R. pectinellus* ($2n = 42$). Hybrids reaching the flowering stage were secured from *R. trifidus* x *R. hirsutus*, *R. trifidus* x *R. ribisoideus*, *R. trifidus* x *R. palmatoides*, *R. ribisoideus* x *R. palmatoides*, *R. ribisoideus* x *R. fauriei* and *R. palmatoides* x *R. fauriei*. Observations on the F_1 hybrids showed woolly pubescence, reddish-purple to green coloration of the old branches and (in *R. trifidus* x *R. hirsutus*) drupe colour ranging from red to yellow to be dominant characters. The occurrence of prickles on the stem and petioles was recessive. Leaf shape and serration and peduncle habit were intermediate between the parents. The F_1 from the cross between *R. trifidus*, with simple palmate leaves, and *R. hirsutus*, with compound pinnate leaves, had mostly compound palmate leaves. In flower size the hybrids were intermediate, with the exception of *R. trifidus* x *R. ribisoideus*, which had larger flowers than its parents. This greater size is attributed to hybrid vigour. The seed-fertile hybrids *R. trifidus* x *R. palmatoides*, *R. ribisoideus* x *R. palmatoides*, *R. ribisoideus* x *R. fauriei* and *R. palmatoides* x *R. fauriei* had regular meiosis, 7_{II} usually being formed. In pollen fertility, they ranged from 99% normal pollen in *R. ribisoideus* x *R. palmatoides* to 85% in *R. trifidus* x *R. palmatoides*. The seed-sterile combinations *R. trifidus* x *R. hirsutus* and *R. trifidus* x *R. ribisoideus* had 7 and 55% normal pollen respectively. In the former hybrid 70% of the PMCs contained univalents and in the latter 64·5%, the configurations $6_{II} + 2_I$ and $5_{II} + 4_I$ being the most frequent in this category. The remaining cells had 7_{II}.

3079 Jinno, T.
Cytogenetic and cytoecological studies on some Japanese species of *Rubus* IV. Relation of polyploidy to flowering time, and to growth rate.
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1958 : **71** : 359–70.

Among the ten diploid species studied, those with cymes were generally later in time of flowering than those with solitary inflorescences. *R. sieboldii* (4*x*) and *R. pectinellus* (6*x*), which have solitary inflorescences, flowered later than any of the diploid species with the same type of inflorescence. The octoploids *R. buergeri*, *R. pseudo-sieboldii* and *R. hakonensis*, with racemes, were much later in flowering than the two above-mentioned polyploids. In propagation by stem cuttings, the polyploids had better rooting capacity, lower rates of bud opening and leaf growth during the initial stage of development of the cuttings and a higher rate of leaf growth at the later stage, compared with the diploids.

3080 Maurer, K. J.
Über die Bewertung einiger älterer und neurerer Himbeersorten. (**The evaluation of some old and new raspberry varieties**).
Mitt. dtsch. LandwGes. 1958 : **73** : No. 43; Reich Landfrau 1958 : No. 43 : 351–53.

The results of trials conducted at Poznań, Poland, with ten varieties are discussed, brief descriptive notes being also provided on the varieties mentioned.

3081 Fritzsche, R.
Beiträge zur Ätiologie des Himbeerrutensterbens. (**Contributions to the etiology of raspberry cane die-back**).
Arch. Gartenb. 1958 : **6** : 171–216.

In this report from the Phytopathological Institute, Aschersleben, the varieties Gelbe Antwerpener [Yellow Antwerp], Harzjuwel [Harz Jewel], Lloyd George and Winklers Sämling [Winkler's Seedling] are mentioned for their

considerable resistance to this disease, which is caused by a complex of factors including shortage of soil moisture, mechanical injury to the canes and attack by *Thomasiniana theobaldi* and various fungi.

3082 HÅRDH, J. E.
Versotaudin ja punkkien esiintyminen vadelmalajikkeissa. (**The incidence of spur blight and mites on some red raspberry varieties**).
Maatalous ja Koetoiminta 1956 : **10** : 131–35.

Data are given for infection of raspberry varieties by *Didymella applanata* when grown on a heavily infested site, and by the mites *Eriophyes gracilis* and *Tetranychus althaeae*. Greatest average resistance to spur blight was shown by Preussen, which was also unattacked by mites. Other varieties free from mite attack were Asker, Pyne's Royal, Milton, Newburgh and Viking. Of these, Pyne's Royal and Viking showed considerable resistance to spur blight.

3083 SLATE, G. L.
Darrow—a promising new blackberry.
Fm. Res. 1958 : **24** : No. 4 : p. 7.

Developed at the New York State Agricultural Experiment Station, Geneva, Darrow [NY15826 (Eldorado x Brewer) x Hedrick] has consistently outyielded other varieties and selections under trial and been outstanding in vigour and winter hardiness. Bearing large, firm berries mildly subacid in flavour and good in quality, it begins to ripen early and continues to fruit over a long period.

3084 **New blackberry.**
Amer. Nurserym. 1959 : **109** : No. 2 : p. 57.

Floragrand has been developed from a cross between Regal Ness and a native trailing blackberry at the University of Florida Agricultural Experiment Station. Its evergreen canes are vigorous and highly resistant to disease. Early in ripening, the variety bears large, tart berries attractive in appearance.

3085 **Name new blackberry.**
Amer. Nurserym. 1958 : **108** : No. 9 : p. 28.

Darrow was bred at Cornell University Experiment Station, Geneva, NY, from NY15826 x Hedrick, both parents being derived from Eldorado x Brewer. The variety is vigorous, productive, regular in bearing and hardier than most other blackberries grown at the station. Ripening in late July at the same time as Eldorado, it produces firm berries 1 in. long and ¾ in. wide. [Cf. 3083].

3086 BJURMAN, B.
The photosynthesis in diploid and tetraploid *Ribes satigrum*.
Physiol. Plant. 1959 : **12** : 183–87.

The diploid of *R. satigrum* (*R. sativum* x *R. nigrum*) had a higher rate of photosynthesis, slightly lower chlorophyll content per cm.² of leaf area and about 45% more stomata than the colchicine-induced tetraploid. The difference in number of stomata is regarded as the cause of the difference in photosynthetic rate.

3087 SORGE, P.
Die Johannisbeersorte 'Rote Spätlese'. (**The currant variety Red Late-Harvest**).
Dtsch. Gartenbau 1958 : **5** : 293–95.

A full description is presented of this variety which has been available to growers since 1942. It blooms so late that frost damage is avoided and regularly gives a high yield; this variety is highly recommended for industrial purposes. Rote Holländische [Red Dutch] and Andenken an Lorgus [Souvenir of Lorgus] were the parents of Rote Spätlese.

3088 BERGELIN, E. & SAHLSTRÖM, H.
Sortförsök med röda vinbär 1943–1957. (**Varietal trials of red currants 1943-1957**).
Medd. Trädgårdsförs. 1958 : No. 116 : 1–18.

BERGELIN, E. & SAHLSTRÖM, H.
Sortförsök med röda vinbär. (**Varietal trials of red currants**).
Försök o. Forskn. 1958 : No. 10 : 96–97.

Results of trials of seven varieties, conducted in various provinces of Sweden, are reported. Röda hollänska [Red Dutch] was resistant and Erstling aus Vierlanden and Houghton Castle were fairly resistant to leaf drop caused by *Pseudopeziza ribis*. The same varieties were the most resistant to damage by winter frosts and gave the best yields in northern Sweden. Houghton Castle was the most productive in southern Sweden.

3089 **Two new blueberries.**
Agric. Res., Wash. 1959 : **7** : No. 9 : p. 16.

Developed at the North Carolina Agricultural Station, Garden Blue and Menditoo are suitable for the coastal plain from North Carolina to Louisiana. Garden Blue gives high yields of medium-sized berries which are well distributed on long clusters, picking thus being facilitated. In eastern North Carolina, its fruiting season

lasts from mid-June to mid-July. Suitable for domestic gardens and local marketing and beginning to ripen a week later than Garden Blue, Menditoo is notable for its good flavour and large, dark blue berries. It bears loose, medium-sized clusters and ripens over a period of 6–8 weeks. Both varieties have small dry scars.

3090 Darrow, G. M.
Seed number in blueberry fruits.
Proc. Amer. Soc. hort. Sci. 1958 : **72** : 212–15.

Data are given on the seed number per berry and weight per 10 berries of a wide range of *Vaccinium* species, varieties and selections grown at Beltsville, Md. The differences in seed number between varieties and selections recently used in breeding are so considerable that time could be saved in breeding by using those with the most seed as ♀ parents. Although in general varieties and selections with the largest berries had the highest number or seeds, this relationship did not hold for all varieties.

3091 Ernst, E. & Stritzke, S.
Die Rose—ein wertvoller Fruchtlieferant.
(The rose, a valuable fruit producer).
Dtsch. Gartenbau 1958 : **5** : 243–45.

At the Horticultural Institute of Dresden-Pillnitz, investigations have been made on the vitamin C content of the fruit of a number of species and varieties of *Rosa*. *R. pendulina* is particularly promising for it has shown ascorbic acid values ranging from 900 to over 2000 mg. per 100 g. of fresh fruit. The vitamin C content of pulp, juice and wine made from the fruits of some of the material was also determined.

3092 **Earlimore strawberry.**
Amer. Nurserym. 1959 : **109** : No. 1 : p. 57.

Developed at the Horticulture Department of the University of Minnesota, Earlimore is a June-bearing variety most suitable for use as fresh dessert. It has shown a high degree of winter hardiness and resistance to leaf spot and scorch.

3093 Morrow, E. B., Comstock, R. E. & Kelleher, T.
Genetic variances in strawberries.
Proc. Amer. Soc. hort. Sci. 1958 : **72** : 170–85.

Forty parents were divided at random into 4 sets of 10 and each set subdivided into 2 groups of 5. Within each set of 10, each parent in one group was crossed with all the parents in the other group. The progenies were planted out in seedling squares in a randomized-block design. Observations were made on total fruit weight, fruit per unit square size, number of berries, average berry weight, earliness, square size, prolificacy and vigour. From these data, variances were estimated and partitioned into additive genetic, dominance, total genetic and phenotypic components. It appeared that the seedling square was an adequate basis for preliminary selection. Genetic variation was high, especially in respect of fruit yield, and it appeared that selection for this character would involve no detrimental association with any other of the characters studied.

3094 Nürnberg-Krüger, U.
Genetische Untersuchungen an diploiden *Fragaria*-Arten. I. Mitteilung. Die Kreuzung zwischen *Fr. vesca* und *Fr. nilgerrensis*, ihre Auswirkung auf die Morphologie der Pflanzen und die Ausbildung des Geschlechts. **(Genetical investigations on diploid *Fragaria* species. I. The cross between *F. vesca* and *F. nilgerrensis*, its effect on the morphology of the plants and the development of sex).**
Z. VererbLehre 1958 : **89** : 747–73.

F. nilgerrensis, an Asiatic species, differs markedly from the other diploid species, *F. viridis* and *F. vesca*. It has been suggested that the last is the ancestral form from which the polyploid species arose. Schiemann effected the cross *F. vesca* x *F. nilgerrensis* in 1941 and obtained 11 normally developed plants with intermediate characters and seven dwarfs. The hybrids were slow to produce stolons and many did not flower. This cross has now been repeated and no dwarf plants were obtained. The F_1 hybrids were uniform in their morphological characters and completely pollen sterile; when the tetrads separated into single cells, they began to degenerate. Female fertility was also reduced. Hybrids of *F. nilgerrensis* x *F. vesca* included dwarf and semidwarf forms. This cross was completely male and female sterile. Back crosses of *F. vesca* x *F. nilgerrensis* to both parents were made. The morphological characters and the development of the sex organs were studied in detail. The only characters to show Mendelian inheritance were fruit colour and leaf and stolon colour, the former being determined by a single gene and the petiole and stolon

colour by two main genes and cytoplasmic factors. Most specific characters such as plant height and leaf size were of a quantitative nature and appeared to be under polygenic control. There was a strong correlation between plant height and leaf size. Both back-cross progenies included extremely stunted forms, dwarfs and semidwarfs and plants of normal size. Plants of the back cross to *F. nilgerrensis* (F_1R_n) were relatively uniform in habit with a marked predominance of *F. nilgerrensis* characters. The *F. vesca* back cross (F_1R_v) showed much greater variation in form. Both back crosses included some markedly aberrant forms resembling other species such as *F. moschata* and *F. viridis*.

A correlation between lack of stolon formation and the dwarf habit was clearly indicated in the F_1R_v progeny. Amongst the F_1R_v plants, 42 dwarfs produced no stolons and 25 were normal in this respect. These two defects were not always associated. It is suggested that certain combinations of *F. vesca* chromosomes with the *F. nilgerrensis* genome have a greater inhibitory effect on growth than combinations of individual *F. nilgerrensis* chromosomes with the *F. vesca* genome. Alternatively a disturbance in the interaction between genome and cytoplasmic factors may be responsible for abnormal development. The fact that the F_1 hybrid shows very little abnormal growth indicates that combined action between recessive genes of *F. nilgerrensis* and *F. vesca* cytoplasm is responsible for defective development.

Delay in reaching the flowering stage occurred in both back-cross progenies; some plants had not flowered after five years of development. In the F_1R_v plants, delay in flowering was independent of inhibition of vegetative development but in the F_1R_n plants delay in flowering was correlated with lack of stolons.

The back cross F_1R_v yielded true hermaphrodite forms with varying grades of fertility; the highest grade approached that of *F. vesca*, the lowest being similar to that of the F_1. The F_1R_n progeny segregated into 17 hermaphrodite, 4 female, 7 male and 4 completely sterile plants. It is concluded that sex in these plants is controlled by both genetic and cytoplasmic factors. Introducing the genes of *F. nilgerrensis* responsible for sex and fertility into cytoplasm of *F. vesca* disturbs the balance between the genes determining the two sexes in the normally hermaphrodite *F. vesca*. A scheme is suggested indicating the combinations of chromosomes and cytoplasm present in the different sexual forms found in the hybrids. The determination of sex and sterility are discussed in detail.

3095 Günther, E.
Frühreife Erdbeeren nach Kreuzung mit *Fragaria platypetala* Rydb. (**Early ripening strawberries after crossing with *F. platypetala* Rydb.**).
Züchter 1958 : **28** : 144–46.

F. platypetala was found to start flowering at Greifswald about a week before early cultivated varieties such as Müncheberger Frühe [Müncheberg Early] and Brandenburg. Grosse Fruchtbare [Large Fruitful] and Georg Soltwedel were crossed with *F. platypetala* and the flowering time of the hybrids was nearer to that of the cultivated than of the wild parent. More satisfactory results were obtained when Müncheberger Frühe and Prinz Julius Ernst were crossed with *F. platypetala*. Amongst the hybrid progeny were found forms which flowered one week earlier than *F. platypetala* and the ripening of the fruit was correspondingly early. The hybrids had flowers resistant to frost and dark-coloured palatable fruit, which could be easily detached from the calyx. However the low yield and small fruit render these hybrids unsuitable for commercial purposes.

3096 Kronenberg, H. G.
De veredeling van aardbeien. (**Strawberry breeding**).
StudKring. PlantVeredel., Wageningen 1958 : 806–13. (Mimeographed).

Work carried out since 1946 is surveyed. American varieties have proved better parents than Netherlands varieties in respect of colour, firmness, productiveness and uniformity of fruit and fruit set. Crosses with Jucunda, with easily detachable calyces, have yielded a higher proportion of offspring with such calyces than crosses involving other varieties. Abundance also gives a fairly high percentage of progeny with easily detachable calyces. Jucunda has the disadvantage of transmitting poor stamens and pollen to its progeny. Productivity in strawberry is strongly influenced by day length and other environmental factors, so that varieties from other climates do not do well in the Netherlands, Climax and Talisman being among the less sensitive varieties. Senga Sengana has shown good winter hardiness. In studies of fruit colour, the crosses light red x light red and light red x dark red each gave an F_1 in which about half the plants had a normal fruit colour, but the second cross gave a higher proportion of dark-red fruited plants than the first. Strawberry being an octoploid plant, it is assumed that intensity of colour increases with increasing number of genomes carrying the

factor for red fruit colour. White-fruited offspring were obtained only in crosses with the white-fruited variety Ananasaardbei [Pineapple strawberry]. Crosses involving white-fleshed and orange-fleshed varieties gave more white-fleshed individuals among plants with light red fruits than among those with normal or dark red fruits. Crosses among American varieties with red flesh yielded exclusively red-fleshed progeny.
In breeding for resistance to damage by night frosts, a ♀ selection of wild *Fragaria virginiana* has shown a certain degree of resistance and is being used in a back-crossing programme.

XXXVIII° Session Plénière Officielle du Comité de l'O.I.V., Luxembourg: 1–5 Septembre 1958. (**XXXVIIIth Plenary Official Session of the Committee of the International Wine Bureau, Luxembourg: 1-5 September, 1958**).
Bull. Off. int. Vin 1959 : **31** : No. 335 : 18–68.

3097 *Branas, J. Méthodes de description ampélographique et leur valeur pour l'identification des variétés.* (*Methods of ampelographic description and their value for the identification of varieties*). (*pp. 18–41*).
The substance of this paper has been summarized from another source [cf. **3110**].

3098 *Hohl, P. Dégats occasionnés par le gel au cours des dernières campagnes.* (*Damage caused by frost during recent seasons*). (*pp. 41–68*).
Information is presented on the damage suffered by five important varieties during 1956 in Germany. Lists are provided of varieties found to be resistant, fairly resistant or susceptible in Bulgaria.

3099 Potec, I., Potec, E., Mereuţă, N. & Ene, M.
Comportarea cîtorva soiuri de struguri în condiţiile nefavorabile de vegetaţie ale anului 1955. (**Behaviour of some grape varieties under the unfavourable growing conditions of the year 1955**).
An. Lucrăr. şti. Inst. agron. Ion Ionescu de la Brad Iaşi 1957 : 123–29.
Data are provided on the yield and incidence of disease of 22 varieties grown in the Copou and Vişani grape-growing centres and the Cotnari vineyard. The year 1955 was unusually cold and wet.

3100 Constantinescu, G.
Aplicarea mentorului la viţa de vie prin dublă altoire în verde. (**The application of the mentor to the vine involving double grafting in the green state**).
An. Lucrăr. şti. Inst. agron. N. Bălcescu Bucureşti 1957 : 159–66.
The above technique is stated to have proved useful in inducing morphological changes, increasing earliness and improving fertility in some hybrid combinations effected in Bucureşti.

3101 Cosmo, I. & Polsinelli, M.
"Montù"
Ann. Sper. agr. 1958 : **12** : No. 6 : Suppl. lxxvii–lxxxiii.
Some doubt is attached to the origin of the vine described, which is grown in the Bologna region of Italy. It is used only for wine production, usually in combination with other varieties.

3102 Cosmo, I. & Polsinelli, M.
"Riesling Renano". (**Rhine Riesling**).
Ann. Sper. agr. 1958 : **12** : No. 6 : Suppl. lxxxv–xci.
The German vine Rheinriesling [Rhine Riesling] is grown in northern Italy in small quantities. It is distinct from the vine known as Riesling italico [Italian Riesling] and is described. It produces a fine white wine of good aromatic quality.

3103 Cosmo, I. & Polsinelli, M.
"Ortrugo".
Ann. Sper. agr. 1958 : **12** : No. 6 : Suppl. xciii–xcix.
The white grape described is grown to a certain extent for wine making in the Piacenza region of northern Italy.

3104 Cosmo, I. & Polsinelli, M.
"Sauvignon".
Ann. Sper. agr. 1958 : **12** : No. 6 : Suppl. ci–cix.
The vine described was introduced into Italy from France. Features are pointed out which enable it to be distinguished from Tocai friulano [Friuli Tokai], with which it is sometimes confused.

3105 Potec, I.
Biotipuri ale soiului de viţă Grasă de Cotnari. (**Biotypes of the vine variety Grasă de Cotnari**).
Lucrăr. şti. Inst. agron. Ion Ionescu de la Brad Iaşi 1958 : 313–21.
Ampelographic descriptions are given of three biotypes of the old local variety Grasă de

Cotnari [Cotnari Plump]. They are designated Grasă Galbenă [Yellow Plump], Grasă verde [Green Plump] and Grasă Crocantă [Crunchy Plump].

3106 Bous, A. K.
(A new seedling for northern viticulture).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1959 : No. 1 : p. 50. [Russian].

Hasanskij Bous (Dal'nevostočnyj Tihonova [Tihonov's Far Eastern] x Amurskij Oboepolyj [Amur Perfect-flowered]) was bred at the Hasan state farm in the Primor'e. It is highly productive, very early, winter hardy and resistant to fungi. The mean weight of a bunch is 50 g. and the grapes are black, sweet, of even size, and have thin skins.

3107 Maingonnat, A.
Les cépages musqués. **(Muscat vines).** Progr. agric. vitic. 1958 : **79** : 149–52, 207–14.

This paper has been summarized from another source [cf. 1969].

3108 Kozma, P., Polyák, D. & Polyák, D. (Mrs.)
Növényi ivari reagensek alkalmazhatóságának tanulmányozása a szőlőn. **(An investigation into the possibility of using plant sex indicators in the vine).**
Szőlészet. Kutató Int. Évkönyv. 1958 : **1** : 213–25. [from: Hungar. agric. Rev. 1958 : **7** : No. 4 : p. 6].

Differences in qualitative and quantitative aminoacid composition and in quantities of leaf pigments have been found among different Kadarka clones with male, female, hermaphrodite or irregular flower types. Male clones are reported to show a higher oxidation capacity and to have tissues lower in pH than female clones.

3109 Vivona, A.
I portinnesti Siciliani della vite. Parte I. **(The Sicilian vine rootstocks. I.)**
Ann. Sper. agr. 1958 : **12** : No. 6 : Suppl. i–xxvii; 1959 : **13** : No. 1 : Suppl. i–xxx.

An historical account is given of the ravages of phylloxera in Sicily at the turn of the century and the various hybrid rootstocks tested. Data presented show that some two-thirds of the rootstocks now used are stocks produced in Sicily, largely by the work of the breeders A. Ruggeri and F. Paulsen; full details are given of their characteristics and parentage. The most popular of all is 140R, a hybrid of Berlandieri x Rupestris du Lot produced by Ruggeri.

Details are given concerning the relative merits of the rootstocks in respect of many desirable characteristics other than resistance to phylloxera, such as affinity with the main Sicilian vine cultivars, resistance to *Bacterium tumefaciens*, drought and excessive lime, adaptation to different soil types, root development, longevity and the yield and other qualities they confer on the grafted scion.

3110 Branas, J.
Des méthodes ampélographiques. **(Ampelographic methods).**
Progr. agric. vitic. 1958 : **79** : 137–48, 165–78, 201–07.

Morphological methods used in identifying cultivated vines are critically discussed.

FORESTRY

Report on forest research by the Forestry Commission for the year ended March, 1957. Pp. 176.

3111 *Lines, R. & Aldhous, J. R. Provenance studies. (pp. 51–58).*

Provenance studies are reported on Sitka spruce, European larch, *Pinus contorta, P. nigra, P. ponderosa* and Scots pine. In *Larix decidua* x *L. leptolepis* there is no apparent superiority of the first-generation hybrid over the second-generation hybrid on the criterion of basal area but the third generation is significantly poorer.

3112 *Matthews, J. D. & Mitchell, A. F. Forest genetics. (pp. 62–64).*

The location of suitable seed sources for current planting programmes and the testing and propagation of plus trees of Scots pine, larch, Douglas fir and beech for breeding continued. Seed orchards and tree banks are being formed on which future breeding work will depend. Clones of European and Japanese larch are being planted to produce the first-generation interspecific hybrids. An attempt was made to self pollinate the larches and Douglas fir for the production of inbred lines. A summary of tree breeding techniques is given.

3113 *Biggs, P. Studies on* Meria laricis, *needle-cast disease of larch. (pp. 102–04).*

The number of strains of *M. laricis* now recognized has been reduced to four. Inoculation experiments indicate that each strain is unstable in the host. Primary infection apparently occurs on European larch and all "severe" attacks have been found on European larch.

3114 *Manners, J. G. Relationship between larch canker and* Trichoscyphella willkommii. (*pp. 104–05*).

The susceptibilities of larches to frost and to *T.* (*Dasyscypha*) *willkommii* appear to be correlated. Trees of Polish (Kraców) origin proved more resistant to frost than trees of Scottish (Moray) origin. Japanese larch showed little more resistance to frost than European larch.

3115 *Laing, E. V. Morphological variations in conifers.* (*pp. 108–09*).

From an investigation of *Pseudotsuga* it appears that there is a series of gradations from the green Douglas fir through *P. vancouveriensis* to the blue Douglas fir and on to the species of China and Japan.

3116 Holzer, K.
Zweck und Ziel der Forstpflanzenzüchtung. (**The purpose and aim of forest-tree breeding**).
Allg. Forstztg. 1958 : **69** : p. 283.

A brief mention is made of the selection and testing of forest trees with improved genotypic characters.

3117 Zweck und Ziel der Forstpflanzenzüchtung. (**The purpose and aim of forest-tree breeding**).
Landwirtschaft 1958 : No. 19 : p. 9.

A brief and popular article on forest-tree breeding in Alpine regions is provided.

3118 Nekrasov, V. I.
(**A conference on breeding research in forestry**).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. 1958 : No. 5 : 628–31. [Russian].

This article briefly discusses papers read at a conference held in Moscow in June 1957 and refers to important economic forms of deciduous trees and conifers obtained by selection or vegetative and sexual hybridization in the Soviet Union in recent years [cf. XXV, 551–569]. The papers deal with a diversity of subjects, including distant hybridization, resistance breeding, selection of quick-growing biotypes and polyploidy.

3119 Sarvas, R.
Skogsskötsel och växtförädling. (**Forest management and plant breeding**).
Svenska SkogsvFören. Tidskr. 1957 : **55** : 337–43.

This paper has already been summarized from another source [XXVIII, 949].

3120 Den IX Nordiske Skogkongress. (**The IXth Scandinavian Forest Congress**).
Norsk Skogbruk 1958 : No. 18 : 525–26.

Among reports of some of the excursions made during the above congress, one by M. Haugberg is chiefly concerned with work at Sundmo in Norrland, Sweden, where clonal collections for seed plantations are being multiplied and provenance trials of various species are in progress. It is noted that hybrids between European and Japanese larch do not appear to be frost hardy and that good hardiness and growth have been shown by hybrids of European and Siberian larch. The triple hybrid of *L. sibirica* and *L. eurolepis* has also shown promise.

3121 Joranson, P. N.
Basic research in forest genetics—who is doing it.
TAPPI, Pa. 1956 : **39** : No. 5 : 52A, 54A, 56A.

The need for more fundamental research in forest genetics and physiology is stressed and a list of stations and institutes in the USA where such work is in progress is included.

3122 Matthews, J. D.
Production and use of superior tree seed in Britain.
Quart. J. For. 1959 : **53** : 12–22.

Mainly with reference to conifers, an account is given of surveying for suitable seed parents, provenance trials, intraspecific breeding by open pollination of clonal mixtures of plus trees in seed orchards and selection of the clones on the basis of progeny trials, and other aspects of seed production. Reference is also made to selection within the parental species (*Larix leptolepis* and *L. decidua*) of *L. eurolepis* and the parent species (*Cupressus macrocarpa* and *Chamaecyparis nootkatensis*) of *Cupressocyparis leylandii*, prior to the establishment of seed orchards for the large-scale production of the hybrids.

3123 Vyskot, M.
Vergleich der positiven und negativen Auslese in der Waldbautechnik. (**The comparison of positive and negative selections in sylvicultural technique**).
Za socialist. sel'skohozjajstv. Nauk. (For socialist agric. Sci.), Praha : Ser. A : 1958 : **7** : 409–50.

The results of experiments carried out in Brno with Norway spruce, pine and oak indicated that positive selection has a greater effect than negative selection; in most cases positive selection resulted in improvement of the growth rate.

3124 Silliman, F. E. & Leisner, R. S.
An analysis of a colony of hybrid oaks.
Amer. J. Bot. 1958 : **45** : 730–36.

A population of hybrids involving *Quercus alba* and *Q. montana*, situated in the Piedmont area of North Carolina, was analysed by means of Anderson's hybrid index method, the length of the terminal bud of mature twigs and the leaf characters of lobe number, degree of incision of the blade, presence of secondary lobes and the apex being evaluated. For purposes of comparison, a population in which the two species are growing together without apparent intergradation was also studied. The latter population is in a stable, undisturbed environment, whereas the area in which the hybrid population is growing shows evidence of successive disturbances as the result of fire and lumbering. The disturbed habitat is considered to have played a major part in the establishment of the hybrids.

3125 Oescu, C. V.
Contribuții la cunoașterea florei din jurul Iașilor. (**Contributions to the knowledge of the flora in the neighbourhood of Iași**).
An. Lucrăr. ști. Inst. agron. Ion Ionescu de la Brad Iași 1957 : 93–97.

A new form of oak, *Quercus pedunculiflora* var. *pinnatipartita* f. *multilobulosa*, is described; it is characterized by secondary lobules on the primary lobes.

3126 Bourdeau, P. F.
Photosynthetic and respiratory rates in leaves of male and female quaking aspens.
For. Sci. 1958 : **4** : 331–34.

In leaves of female plants of *Populus tremuloides*, respiration rate was significantly higher (37%) than in male plants, while net photosynthesis and chlorophyll content were slightly but not significantly lower (10 and 14%, respectively). Surface area, water content, weight per unit area and nitrogen content of the leaves were similar in the two sexes.

3127 Eifler, I.
Kreuzungen zwischen *Betula verrucosa* und *Betula pubescens*. (**Crosses between *B. verrucosa* and *B. pubescens***).
Züchter 1958 : **28** : 331–36.

At the breeding station in Waldsieversdorf, Germany, chromosome counts were made from root tips of progeny from crosses of *B. verrucosa* x *B. pubescens*. Most of the hybrids investigated appeared to have 42 chromosomes, but it was often not possible to determine the exact number. In 16 cases, the number was found to be a little below or above 42. The hybrids were distinguishable by their leaves which in certain characters resembled those of colchicine-induced tetraploid birches.

3128 Dellingshausen, M. v. & Stern, K.
Über einige besondere Blütenformen der Birke. (**Some special flower forms in birch**).
Silv. genet. 1958 : **7** : 181–88.

The literature on abnormal flower development in birch is briefly reviewed and abnormalities observed at Schmalenbeck are described. These abnormalities include bisexual inflorescences, two cases of male sterility in *Betula verrucosa* and *B. pubescens* and two other abnormal floral developments which are thought to be the results of shoot mutation.

3129 Barlow, B. A.
A stage in the evolution of apomixis in Casuarina.
Aust. J. Sci. 1958 : **21** : p. 108. (Abst.).

In the diecious species *C. nana* ($x = 11$), diploid and tetraploid forms occur which reproduce sexually. In other populations, however, a complex breeding system is operative which may represent a stage in the development of obligatory apomixis. These populations consist mainly of triploid females, with a few diploids and tetraploids. The triploid females give rise to mixed progenies of triploids, tetraploids and heteroploid twins. Embryological observations support the view that the triploid females have unreduced embryo sacs, fertilization by a diploid ♂ resulting in tetraploids and pseudogamic parthenogenesis in triploids. If, through mutation, pseudogamy and thus diploids became unnecessary, the establishment of completely apomictic populations of triploid females would be possible. Such a condition has been reported in *C. distyla* and *C. striata*.

3130 Ram Prakash
Cytological studies of *Crescentia cujete* Linn.
Proc. Bihar Acad. agric. Sci. 1955 : **4** : 118–19.

C. cujete has a chromosome number of $2n = 18$, 9_{II} being formed at metaphase I.

3131 Ljunger, Å.
Al och alförädling. (**Alder and alder breeding**).
Skogen 1959 : **46** : 115–17.

Compared with *Alnus glutinosa*, the hybrid *A. glutinosa* x *A. rubra*, produced at Ekebo, Sweden, shows significantly greater growth in height both in the nursery stage and in 7-year

old plantations. Growth prognosis for one hybrid family indicates that it will reach a height of 20 m. by the age of 22–25 years and a final height of 25 m., while *A. glutinosa* takes 40 years to reach 20 m. and rarely attains 25 m. The values for the hybrid agree closely with those for the American parent, *A. rubra*, which is not hardy in Sweden. The hybrid is almost entirely sterile when *A. glutinosa* is used as mother tree but is fertile in the reciprocal cross. The timber quality compares very well with that of hybrid aspen. In an attempt to improve its timber quality, *A. incana*, which is one of the hardiest, most tolerant and most productive trees in Sweden, has been crossed with *A. glutinosa*. Only when *A. incana* is used as mother tree is the hybrid fertile.
In addition to the above, the hybrids *A. hirsuta* x *A. rubra* and *A. incana* x *A. subcordata* are being tested.

3132 Giordano, E.
Il miglioramento genetico degli eucalitti in Italia. (**The genetic improvement of *Eucalyptus* in Italy**).
Cellulosa e Carta 1956 : **7** : No. 7 : 8–12.

Making reference to promising hybrids produced in other countries, the author suggests that hybridization work should be carried out in Italy and urges that, to this end, selection of mother trees and testing of progeny be initiated.

3133 Boden, R. W.
Differential frost resistance within one Eucalyptus species.
Aust. J. Sci. 1958 : **21** : 84–86.

Collections of open-pollinated seed from trees of *E. fastigiata* were made at 2350, 3500 and 3850 ft. on Brown Mountain, New South Wales, and the progenies raised in the open under uniform conditions at Canberra. Considerable variation in frost resistance was observed between the progenies. Variation in this respect but of a lesser magnitude was also found within progenies. Thus the collections have been made at different points in what appears to be a population varying continuously in accordance with environmental gradients. The bearing of these observations on selecting *Eucalyptus* for planting in colder regions is considered.

3134 Sipos, E.
Adatok a magyar *Sorbus*-fajok és változatok faiskolai termesztéséhez. (**Data regarding production of Hungarian *Sorbus* species and varieties in the nursery**).
Kertész. Kutató Int. Évk. 1957 : **2** : 295–339.

Data on the growth of numerous species and varieties and the performance on various rootstocks are presented.

3135 Ragonese, A. E. & Rial Alberti, F.
Mejoramiento de sauces en la República Argentina. (**Willow breeding in the Argentine Republic**).
Rev. Invest. agríc., B. Aires 1958 : **12** : 225–46.

Species, varieties and races are being collected from numerous countries and from within Argentina. Breeding methods are discussed and include: (1) individual selection, in which cuttings from wild trees are compared and the best propagated as clones; (2) natural hybridization, which has already yielded some promising hybrids [cf. 3136]; (3) open pollination followed by selection of desirable types in the F_2; (4) artificial hybridization, which is regarded as the most promising method and has already yielded some heterotic individuals; and (5) induction of polyploidy and mutation. Crossing may be effected with fertile branches kept in water or a nutrient solution in the greenhouse or may be carried out in the field with the aid of bagging. For crossing parents which do not normally flower at the same time, pollen may be preserved at 21° C., or simultaneous flowering may be induced by appropriate photoperiodic treatment. The latter method has been used in crossing male trees of *Salix miyabeana*, which is field-resistant to *Marssonina*, with females of *S. alba* var. *calva*.

3136 Ragonese, A. E. & Rial Alberti, F.
Sauces híbridos originados naturalmente en la República Argentina. (**Hybrid willows of natural origin in the Argentine Republic**).
Rev. Invest. agríc., B. Aires 1958 : **12** : 111–53.

A comparison of the morphological characters of *Salix humboldtiana*, *S. babylonica*, *S. alba* var. *calva* and eight putative hybrids, originating in the Delta region, indicates that the parentage of the hybrids includes the native species *S. humboldtiana*. Data on the time of origin of the hybrids and the time of introduction of the other two species suggest that in most cases the second parent is *S. babylonica*, although *S. alba* var. *calva* is not entirely ruled out. Crosses among the hybrids and species have yielded fertile seeds. The hybrids are assigned to the cultivars Híbrido [Hybrid], Mestizo Pereyra [Pereyra Hybrid], Mestizo, Mestizo Usoz, Mestizo Amos, Híbrido llorón [Weeping Hybrid], Híbrido santafecino [Santa Fe Hybrid] and Híbrido Galvete of the new species *S.* x *argentinensis* and each is described in detail.

3137 Hunziker, J. H.
Estudios citogenéticos en *Salix humboldtiana* y en sauces híbridos triploides cultivados en la Argentina. (**Cytogenetical studies of *S. humboldtiana* and triploid hybrid willows cultivated in Argentina**). Rev. Invest. agríc. B. Aires 1958 : **12** : 155–71.

Among Argentine willows, the indigenous species *S. humboldtiana* has $2n = 38$, regular meiosis and pollen with 94% fertility, while the three male hybrids Híbrido [Hybrid], Mestizo [Hybrid] and Mestizo Pereyra are all triploid, show irregular meiosis with numerous univalents and produce dyads, triads and tetrads and, in one case, monads. The distribution of the hybrids in the Delta region suggests that they result from natural hybridization of female trees of the cultivated tetraploids *S. alba* var. *calva* and *S. babylonica* with male trees of *S. humboldtiana* [cf. 3136].

3138 Skjernaa, S. E.
Forekomst af bitterstoffer i pilearter. (**The occurrence of bitter substances in willow species**).
Hedeselsk. Tidsskr., Aarhus 1958 : **79** : 321–26.

Among 35 species, varieties and crosses, the five species *Salix pentandra, S. cuspidata, S. purpurea, S. myrsinifolia* and a type referred to as the Bussant willow contained bitter substances rendering the leaves unpalatable to grazing animals. The presence of bitter substances in *S. cuspidata,* which is a hybrid between the bitter species *S. pentandra* and the nonbitter species *S. fragilis,* indicates that bitterness is dominant. None of the hardy species used in hedges and shelter belts in Jutland shows the bitter character, and the possibility of crossing to produce hardy bitter forms is discussed.

3139 Golfari, L.
Condiciones ecológicas del cultivo de las Salicáceas en la Argentina. (**Ecological conditions for the cultivation of the Salicaceae in Argentina**).
Rev. Invest. agríc., B. Aires 1958 : **12** : 173–224.

In this account of the cultivation of willows and poplars in Argentina it is noted that clones of the hybrid *Salix* x *argentinensis* [cf. 3136] appear promising in resistance to *Marssonina,* in rate of growth and in adaptation to climatic conditions. Among the poplars, *P. deltoides* cv. *carolinensis* is completely immune from canker caused by *Septoria, P.* x *euramericana* 'Conti' and 'Ayanz' are almost immune, and *P.* x *euramericana* 'Monilifero', 'I–214' and 'I–262' are resistant.

3140 Khoshoo, T. N.
Polyploidy in gymnosperms.
Evolution, NY 1959 : **13** : 24–39.

Literature on the occurrence of polyploidy in normally diploid species and of polyploid species and genera among the gymnosperms is reviewed and the various hypotheses put forward to account for the rarity of polyploidy in the group are examined.

3141 Saito, Y. & Hashizume, H.
(**Studies on a triploid specimen of *Cryptomeria japonica* picked out in afforested land**).
Tottori Daigaku Nogyobu Enshurin Hokoku/Bull. Tottori Univ. For. 1958 : No. 1 : 21–55. [Japanese].

A description is given of a triploid tree ($2n = 33$) discovered in a forest plantation in Okayama. The tree showed the usual gigas characters but was inferior to diploid trees in height, diameter of trunk and volume. Sterility was high. Some details are also provided on a young tetraploid discovered in the nursery.

3142 Squillace, A. E. & Bingham, R. T.
Localized ecotypic variation in western white pine.
For. Sci. 1958 : **4** : 20–34.

Breeding experiments on *Pinus monticola* have revealed the occurrence of local ecotypes. The evidence is based on observations on trees obtained from (1) seed from controlled pollinations effected among 45 trees selected for resistance to blister rust (*Cronartium ribicola*), (2) wind-pollinated seed produced by these trees and (3) wind-pollinated seed collected from blister-rust susceptible controls or from squirrel hoards. The trees were growing in eight areas in northern Idaho and western Montana, some of the areas, although in one case as little as only half a mile apart, representing markedly different environments. On the more favourable planting sites, progenies from trees at moist, low altitudes grew more rapidly, as indicated by observations up to the age of four years, than progenies from trees in poorer sites (dry slopes or higher altitudes). Progenies from trees at high altitudes grew relatively more rapidly when planted at a high altitude than those from parents at low altitudes. Progenies from trees at high altitudes had a higher dry-matter content of the foliage than those from low-altitude sources. Determination of the osmotic pressure of the seeds collected from the parent trees

provided further evidence of inherent differences between trees from the different areas. Low osmotic pressure tended to be associated with lower altitude. Hypotheses concerning the differentiation of local ecotypes are discussed. It is concluded that, where topography is highly variable and when moisture supply during the growing season is critical, factors such as poorer seedling establishment and growth rate discriminate against infiltration of genes from trees adapted to adjacent but radically different sites.

3143 Johnsson, H.
Några data från försökskulturer med nordamerikansk tall. (Some data on test cultures of North American pines).
Svenska SkogsvFören. Tidskr. 1957 : **55** : 345–58.
This paper has already been summarized from another source [XXVIII, 962].

3144 Mergen, F.
Colchicine-induced polyploidy in pines.
J. For. 1959 : **57** : 180–90.
Polyploidy was induced in pines by treating seed, seedlings and male strobili with colchicine; *Pinus elliottii* was used in the experiments on seeds and seedlings and *P. taeda*, *P. nigra* and *P. mugo* were used in the strobili experiments. Treatment of seed during the pregermination period produced only a low number of polyploids. More polyploids were obtained when the seed was allowed to germinate in peat moss saturated with colchicine; this method has the advantage of providing the seed with an excellent germination medium. Polyploids were also obtained by treating freshly germinated seedlings and older seedlings, various methods of treatment being used. The best results were obtained when the seedlings were kept under conditions of optimum growth during treatment. It was found important to keep the colchicine from touching the root. Roots treated with colchicine often developed tumours and the seedlings died. In some cases the polyploid plumule was removed from the polyploid root and successfully grafted on to vigorous diploid plants. The general symptoms of polyploidy in slash pine seedlings resembled those found in induced polyploids of other plants and in natural polyploid slash pines. The abnormal conditions varied from seedlings with dwarfed and swollen radicles, hypocotyls, cotyledons and needles to almost normal seedlings with slightly thickened cotyledons; needles were often of the gigas type. But abnormal conditions did not always indicate polyploidy and the size of the guard cells and the size of the nuclei were not reliable criteria for polyploidy. Immediately after treatment, "C pairs" of chromosomes with the appearance of pairs of skis were observed in dividing nuclei. Sometimes $2n$, $4n$ and $8n$ cells were found in the same plant. Many polyploid plants reverted to the diploid condition because the polyploid cells divided at a slower rate than the diploid. Both mixoploid plants, in which polyploid cells occurred in an unorganized manner, and chimeras having either a shoot or section of the stem entirely polyploid were found.
Colchicine treatment of immature strobili increased the percentage of imperfect tetrads; in many dividing microspore mother cells, the partition walls started to form but aborted leaving the chromatin from two nuclei within one cell. It is thought that some diploid pollen was obtained; viable *P. mugo* pollen is to be used in attempts to produce triploids. None of the slash pine polyploids had any obvious features of value for forestry purposes but nothing is known of their resistance to diseases and insects.

3145 Mergen, F.
Natural polyploidy in slash pine.
For. Sci. 1958 : **4** : 283–95.
Abnormal seedlings showing poor growth and underdeveloped root systems occurred with a frequency of 0·002% in *Pinus elliottii* in the Florida State Nursery at Olustee, Fla. Each of the five abnormal seedlings studied proved to be mixoploid, with either $2n$ and $4n$ cells or $2n$, $3n$ and $4n$ cells. The polyploid cells appeared to occur chiefly around the periphery of the meristems.

3146 Bordeau, P. F. & Mergen, F.
Photosynthesis and respiration in colchicine-induced polyploid seedlings of slash pine.
J. For. 1959 : **57** : 191–93.
Significantly lower rates of photosynthesis were found in both primary and secondary needles of polyploid seedlings of *Pinus elliottii* as compared with diploid plants. The polyploid shoots had a slower rate of growth than the diploids, although they had been grafted on diploid root stocks; it is suggested that the lower rate of photosynthesis contributed to the slower growth rate of the polyploids. Polyploidy did not significantly affect the rate of respiration. [Cf. 3144].

3147 Nesterov, V. G. & Mamaev, S. A.
(Studying the inheritance of growth types in forest trees).
Izv. Timirjazev. sel'skohozjajstv. Akad. (News Timirjazev agric. Acad.) 1958 : No. 6 : 7–16. [Russian].

Experiments with pines of different growth classes belonging to (*a*) slow and (*b*) quick-growing biotypes at the Timirjazev Agricultural Academy suggest that these biotypes give progenies differing in developmental characteristics. In particular, heritable differences were noted in response to light and in growth rate in the first year. The amount of fruiting of the two biotypes was found to depend very largely on environmental factors and to a slight extent also on heredity.

3148 Squillace, A. E. & Bingham, R. T.
Selective fertilization in *Pinus monticola* Dougl. I. Preliminary results.
Silv. genet. 1958 : **7** : 188–96.

Attempts were made to determine whether there is any selective fertilization when pollen from a *P. monticola* tree is in competition with pollen from another tree of the same species. Controlled pollinations were made using three different trees; in each test, an individual tree was self pollinated, cross pollinated and pollinated with a mixture of equal proportions of self pollen and pollen from the tree used in the cross. The proportions of selfs and crosses in the mixed progeny were determined by comparing the early growth rates of the mixed progeny with those of the corresponding self and cross progenies, these comparisons being made on one-year old plants. When a moderately self-fertile tree was used as the seed parent, crossing exceeded selfing. In the two other tests, a highly fertile tree was used as the seed parent. Crossing exceeded selfing, when pollen from this tree was mixed with that of one of the other trees but the reverse was true when pollen from a different tree was used in the mixture.

It is thought likely that crossing usually occurs in self-sterile or moderately self-fertile trees but highly self-fertile trees may favour either selfing or crossing, this depending upon cross fertility and competition in pollen-tube growth or other factors affecting the trees concerned. *P. monticola* under natural conditions is probably largely cross pollinated because (1) most trees are less self fertile than they are cross fertile [cf. XXVI, 1826] and (2) the trees receive a mixture of pollens from many trees and it is probable that one or more of these pollens is more competitive than self pollen even in the relatively few highly self-fertile trees. In addition to the tests mentioned, other more extensive determinations of the growth rate of wind-pollinated seedlings as compared with those of seedlings resulting from self pollinations and controlled crosses also indicate that crossing exceeds selfing under natural conditions.

Some suggestions for future tests on selective fertilization are discussed.

3149 Patton, R. F. & Riker, A. J.
Rooting cuttings of white pine.
For. Sci. 1958 : **4** : 116–27.

Investigations on the vegetative propagation of *Pinus strobus*, undertaken as part of the project on the development of blister-blight selections in Wisconsin, are described. Clonal differences were found in rooting ability.

3150 Harm, H.
Frühtest an *Pinus nigra* auf ihre Harzergiebigkeit. **(An early test with *P. nigra* on its resin productivity).**
Allg. Forstztg. 1959 : **70** : 23–27.

This test conducted at Mariabrunn was carried out on six-year old progenies of selected mother trees which had been cross pollinated. The progeny of trees selected for their high resin production outyielded progeny of low yielders on the average by about 70%; these differences appeared to be under genetic control. Progeny of both good and poor yielders showed considerable variation in their yield of resin indicating that the pollen parent may affect the performance of the progeny. Selected mother trees have now been vegetatively propagated and controlled pollinations carried out in order to determine the effect of the pollen parents on resin productivity. The resin yield per unit area did not show a direct correlation with either needle weight or wood production.

3151 Jackson, L. W. R. & Greene, J. T.
Tracheid length variation and inheritance in slash and loblolly pine.
For. Sci. 1958 : **4** : 316–18.

Comparisons of the length of the first-ring tracheids in branches were made between parents and progeny in seven open-pollinated slash pines (*Pinus elliottii*), three open-pollinated loblolly pines (*P. taeda*), and one slash x slash, two loblolly x loblolly and four slash x loblolly hybrids. In the open-pollinated material, tracheid length in the progeny was generally less than in the parents, but the offspring of the parents with longer tracheids usually had longer tracheids than progenies from parents with shorter tracheids. In the cross-pollinated series, tracheid length in the progeny was generally

intermediate between the lengths in the parents but was closer to that of the mother tree. On the basis of these results it is suggested that breeding for long or short tracheids should be possible.

3152 Schröck, O.
Die Untersuchung der phototropischen Reaktion als Auslesemethode bei Kiefernsämlingen auf Gradschäftigkeit. **(The investigation of the phototropic response as a method of selecting for straight stem in pine seedlings).**
Züchter 1958 : **28** : 320–23.

A method is described for measuring the phototropic response of the hypocotyls of young pine seedlings, the growth of the hypocotyl during the reaction time being taken into consideration. A specially adapted instrument is used for measuring the distance from the tip to the foot of the hypocotyl at the beginning and end of the reaction time. Seedlings with a weak phototropic response develop straighter stems than those with a strong reaction.
At Waldsieversdorf, Germany, a large number of selected plants and hybrid progenies were tested in this way and considerable variation in the phototropic response was observed. Some promising straight-stemmed plants were found.

3153 Klotz, K.
Neue Forschungsergebnisse über die Fichte und ihre waldbaulichen Folgerungen. **(New results of research on the spruce and their consequences with reference to forestry).**
Allg. Forstztg. 1959 : **70** : 4–7.

Some of Priehäusser's work on spruce is briefly described; autochthonous stands in the Bavarian Forest were investigated by Priehäusser, who worked out a key for identifying different races and combinations of races from their phenotypic characters. The three races *europaea, acuminata* and *obovata* have characteristic crowns and cones [cf. XXVI, 3820]. The author has used Priehäusser's key with some modification in studying spruces in the inner regions of the Bavarian Forest. Since the races and interracial combinations differ in many important characters, Priehäusser's key is useful in selecting types of spruce for cultivation in different environments.

3154 Little, E. L. (Jun.) & Pauley, S. S.
A natural hybrid between black and white spruce in Minnesota.
Amer. Midl. Nat. 1958 : **60** : 202–11.

A natural hybrid between *Picea mariana* and *P. glauca* was discovered near Cromwell, Minn., in 1955; this is thought to be the first report of such a cross, although the two species have almost identical ranges in parts of the American continent. The interspecific cross is designated *Picea glauca* x *mariana* and the Minnesota form is given the varietal name Rosendahl spruce.
A botanical description of the hybrid is provided. Rosendahl spruce is probably a first-generation hybrid for it is intermediate between the parent species in 23 of the 50 characters investigated. It resembles white spruce in 18 characters and black spruce in 7; in 2 characters, it is different from both species. Unlike the black spruce, the hybrid does not develop aphid galls. The haploid chromosome number of the hybrid determined from female gametophyte tissue is 12; the same number has been recorded for both parent species. During 1955, the Rosendahl spruce yielded ¼ bushel of cones but only 3% of the seed was good; seedlings from the hybrid are variable.

3155 Nienstaedt, H.
Receptivity of female strobili of white spruce.
For. Sci. 1958 : **4** : 110–15.

The period of receptivity of the ♀ strobili of six trees of *Picea glauca* growing in north-eastern Wisconsin was studied. The bagged strobili were receptive for a period of 3–5 days. Considerable variation from tree to tree was found with respect to receptivity on specified dates. On a single tree, however, the development of the ♀ strobili was fairly uniform. Little would therefore be gained by confining pollination over a period of days to fully receptive strobili. Pollen shedding coincided fairly well with ♀ receptivity and may be used to advantage as a means of timing controlled pollinations.

3156 Robak, H.
De internasjonale lerkeproveniensforsøk 1944/45 og en svensk forsøksmelding. **(The international larch provenance trials, 1944-45, and a Swedish research report).**
Norsk Skogbruk 1958 : No. 18 : 523–25.

Some results of the Swedish trials forming part of an international European project established in 1944–45 are discussed with reference to a report presented by C. C. Kiellander at the International Union of Forest Research Organizations congress in Oxford in 1956. The Swedish test trees were severely attacked by canker, but some material showed resistance,

notably Japanese larch, a number of spontaneous hybrids between *Larix decidua* and *L. leptolepis* and seed lot 51 from Cierny Vah in the Low Tatra. The last-mentioned also did well in Norway, where there was no canker, and in other countries.

3157 Irgens-Moller, H.
Genotypic variation in the time of cessation of height growth in Douglas-fir.
For. Sci. 1958 : **4** : 325–30.
Seed from five areas in Oregon and British Columbia was grown in a uniform environment at Corvallis, Ore. Plants from coastal climates ceased growth in height 1–4 weeks later than plants from inland areas and were characterized by a shorter interval between the first and second period of internode expansion. Similar differences were found among plants from 20 different sources also grown at Corvallis; in this experiment cessation of growth was detected not by direct measurement but by determining the percentages of plants which were actively growing, in their first dormancy and in their second dormancy. In a further experiment, seedlings from inland areas showed a far greater decrease in active growth under short photoperiods than those from more western regions; this is regarded as an adaptation to areas in which the seasonal changes from summer to winter are severe and abrupt.

VEGETABLES

3158 Müller, N.
Gemüsesaatgut-Neuheitenüberprüfung 1956/57, II. (**Vegetable seed—examination of new varieties 1956/57, II**).
Mitt. Klosterneuburg 1958 : **8** : 287–96.
The results are reported of trials carried out in Austria with varieties of cauliflower, radish, spinach and pea. Descriptive notes are provided on the vegetables tested.

3159 Müller, N.
Gemüsesaatgut-Neuheitenüberprüfung 1956/57, III. (**Vegetable seed—examination of new varieties 1956/57, III**).
Mitt. Klosterneuburg 1958 : **8** : 344–57.
The results are reported of trials of kohl rabi, white cabbage, Savoy cabbage, carrot, dwarf bean, lettuce, tomato, egg plant, melon and cucumber.

3160 Philipp, F.
Ergebnisse der Gemüsesortenversuche 1957, III und IV. (Im Rahmen der österreichischen Zuchtbuchkommission). [**Results of vegetable variety trials 1957. III and IV. (In connexion with the Commission of the Austrian Book of Cultivated Varieties)**].
Mitt. Klosterneuburg 1958 : **8** : 276–87, 330–43.
Results of trials of marrowfat peas, lettuce, cucumber and tomato are reported; descriptive notes on the pea varieties are provided.

3161 Koródi, L.
Az üveg alatti és szabadföldi korai zöldségfélék nemesítési kérdései. (**Questions of breeding early vegetables for the greenhouse and open air**).
Magyar tud. Akad. Agrártud. Oszt. Közl. 1957 : **12** : 343–53.
Among early vegetables, the onion Makó, the red pepper Cece and the cabbage Szabolcs, all developed in Hungary, do well under Hungarian conditions while the Bulgarian heterotic tomato 10 x Bison is unsatisfactory. In trials of tomatoes, Kecskeméti törpe [Kecskemét Dwarf] has surpassed Jubiläum [Jubilee] and Roter Gnom [Red Gnome]; and Frühe Liebe [Early Love], *Lycopersicon esculentum* var. *cerasiforme*, *L. pimpinellifolium* and hybrids of K42 and K22 with Kecskeméti törpe have also shown promise. Problems in breeding early cucumbers are briefly discussed.

3162 Bykov, B. A.
(The All-Union Inspection of Vegetables).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 12 : 28–29. [Russian].
The vegetable varieties exhibited at the All-Union Agricultural Exhibition in 1958 are discussed. Some of them have been bred recently by amateur horticulturists; others came from Gribovo, the Principal Botanic Garden and other institutes. They include high-yielding sweet pepper and egg plants, large-fruited tomatoes and carrots and a hybrid between occidental and oriental radish, with moist white flesh and roots several times larger than European radishes.

3163 **New vegetable varieties for 1959.**
Seed World 1958 : **83** : No. 8 : 10–12, 14, 28, 32; No. 9 : 29–31.
Descriptions are given of varieties of carrot, cabbage, lettuce, radish, onion, cucurbits,

tomato, bean, pea and sweet corn which have been developed by seed firms and state experiment stations in the USA. The following are of particular interest: the cantaloupe Edisto, resistant to *Alternaria* blight and powdery mildew and tolerant of downy mildew; the anthracnose-resistant water melon Blackstone; Hope Diamond, a water melon resistant to both wilt and anthracnose; the sulphur-resistant musk melon SR1463; the hybrid vegetable marrows Cozella (a Cocozelle type), Blackini (a Zucchini type) and Verdue (a Zucchini type x Caserta); the downy-mildew resistant cucumber P51; the hybrid cucumber Burpeeana; the pickling cucumbers Nappa 63, Wisconsin SMR15 and Wisconsin SMR 18, resistant to scab and tolerant of mosaic; the pink-fruited tomato Pinkshipper, with near immunity to *Fusarium* wilt [cf. 842]; Pearson VF6 and Pearson VFII, tomatoes resistant to both *Verticillium* and *Fusarium* wilts; the tomato Indian River (Manalucie x Manalee) combining a high degree of resistance to grey wall, *Fusarium* wilt and grey leaf spot with tolerance of leaf mould, early blight, blossom-end rot, "crease stem and bunching"; the hybrid tomato Wonder Boy; and Resistant Asgrow Valentine, a bean possessing resistance to common bean mosaic.

3164 Fabig, F.
Heterosiszüchtung im Gemüsebau. (**Heterosis breeding in vegetable cultivation**).
Dtsch. Gartenbau 1958 : **5** : 279–81.

A brief and popular account is provided.

3165 Janku, N.
(**Fruit and vegetable growing in Rumania**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 12 : 59–60. [Russian].

Improved vegetable varieties bred recently in Rumania include the tomatoes IKAR4 and Hybrid 7 and the red pepper ŠB. These varieties are highly productive, rich in vitamins and resistant to drought and diseases.

3166 Nishi, S. & Hiraoka, T.
(**Studies on first generation hybrids of vegetables. I. Studies on the utilization of male sterility. 1. Histological studies on male sterility in various vegetables**).
Nogyo Gijutsu Kenkyusho Hokoku/Bull. Nat. Inst. agric. Sci. : Ser. E : 1958 : No. 6 : 1–41. [Japanese].

Male-sterile strains of *Allium fistulosum*, Succession cabbage, (*Brassica pekinensis* 'Chifu' x Succession cabbage) x *B. pekinensis*, radish and tomato have been isolated. Detailed descriptions, accompanied by photomicrographs, are given of the histological events leading to male sterility; in all cases, tapetal malfunctioning is involved.

3167 Salokangas, K.
Uudet avomaan vihanneslajikkeet koeviljelyn valossa. (**New vegetable varieties in the light of outdoor experimental cultivation**).
Koetoiminta ja Käytäntö 1958 : **14** : p. 11.

Beetroot. Sigma OE shows particular promise as a good keeping variety.

Carrot. For summer, autumn and early winter crops, the Danish Nantes Munkegaard II has been recommended for many years. The Norwegian Nantes-Élite is now regarded as better yielding and of equal quality.

Onion. The varieties Autumn Queen, Rijnsburger and Zittau raised in Finland proved better than the Dutch Liva.

Cabbage. Toftegård AH53 has been shown to be the best commercial early variety. Of the early autumn cabbages, the Norwegian Julikonge [July King] is recommended. The Norwegian winter cabbage Faales blåtopp [Faales Blue-top] yields well and is of good keeping quality. Other Norwegian varieties recommended are Trønder, Jåtunsalgets vinterkål [Jåtunsalgets Winter cabbage] and Hinna Amager.

Cauliflower. The Dutch Flora Blanca and Vroege Veentjes [Early Veentje] are recommended as late and early varieties, respectively.

Broccoli. Weibullin Calabrese [Weibull's Calabrese] has given the best results in field trials.

Lettuces. The American varieties recommended for outdoor use are Great Lakes, Cornell 456 and Pennlake. Of the loose-leaved type, Market Favourite and Weibull's Ivea have proved most satisfactory.

Outdoor Cucumber. Favör, Suberb and Cavallius are recommended for greater size of fruit than those formerly grown.

Tomato. A German variety referred to as Vollenduig is recommended for quality and yield, and Norwegian Vollebek 104 is a good early variety. A promising bush variety is the Norwegian Vollebek 58 which is recommended for north Finland.

Sweet corn. Early Alberta and Orchard Baby are recommended on account of their earliness. The Swedish Weibull's Mette has been tried for one year and although slightly later than the others is extremely vigorous.

3168 KAGAWA, A. & SADA, M.
(Studies on the reaction of radishes to low temperature. II. On stage of development and intervarietal differences in connexion with low-temperature reaction).
Gifu Daigaku Nogakubu Kenkyu Hokoku/Res. Bull. Fac. Agric. Gifu Univ. 1957 : No. 8 : 57–66. [Japanese].
Low temperature treatment for 20 days at 5° C. accelerated flowering in three varieties but not in a fourth, Ninenko [Two-year].

3169 TATEBE, T.
(Studies on the genetics of self and cross incompatibility in the radish. III).
Engei Gakkai Zasshi/J. hort. Ass. Japan 1958 : **28** : 154–60. [Japanese].
The Japanese varieties Temman and Miyashige were investigated. In contrast to the usual situation in the Cruciferae, incompatibility in the first variety appeared to be gametophytically determined by a single oppositional multiple allelic *S* series. In the second variety, incompatibility was sporophytically determined by two oppositional multiple allelic series, *S* and *I*, in which *S* is epistatic to *I* but hypostatic to *II*. [Cf. XXVII, 3504].

3170 MUNGER, H. M. & MARTIN, M. W.
Onion variety tests in New York in 1957.
Cornell Univ., NY St. Coll. Agric., Dep. Veg. Crops, Ithaca 1958 : No. VC–67 : unpaginated. (Mimeographed).
The results of trials of a large number of varieties, including F_1 hybrids, in New York State are summarized.

3171 JONES, H. A., FRANKLIN, DeL. F. & PETERSON, C. E.
Bonanza: a new hybrid onion for long storage.
Bull. Idaho agric. Exp. Sta. 1954 : No. 212 : Pp. 6.
Further information is provided on the performance of the F_1 hybrid Bonanza with respect to yield and storage and on its parents, ♂ sterile B2190 and B2215, both of which inbreds were derived from Brigham Yellow Globe [cf. XXV 592 and XXVI, 1070].

3172 FRANKLIN, D. F., JONES, H. A. & PETERSON, C. E.
Fiesta.
Bull. Idaho agric. Exp. Sta. 1954 : No. 211 : Pp. 8.
The onion Fiesta, an F_1 hybrid between a male-sterile inbred of Brigham Yellow Globe and an inbred of Yellow Sweet Spanish, combines the yielding capacity of the latter parent with improved storage quality. It also has vigorous seedling emergence, uniformity, earliness, high content of solids and more resistance to purple blotch than Sweet Spanish strains.

3173 **Branding onion outcasts.**
Agric. Res., Wash. 1959 : **7** : No. 8 : 8–9.
The value of introducing marker characters into the parental lines of F_1 onion hybrids in order to detect off-types is indicated.

3174 AHUJA, M. R.
The nucleolar chromosomes of *Allium cepa*.
J. Hered. 1958 : **49** : 247–49.
In addition to the long pair of satellited chromosomes with subterminal centric constrictions, as described in *A. cepa* by previous investigators, another pair characterized by submedian centromeres and satellites was observed in root-tip nuclei of Early Yellow Globe. Southport White Globe and Red Weatherfield had three satellited chromosomes, comprising the long pair and only one representative of the type with a submedian centromere. Early Yellow Globe had a maximum number of four nucleoli per nucleus, with the mode at three. The other two varieties had one or two, the failure of the third satellited chromosome to form a nucleolus being attributed to its inability to compete with two stronger nucleolar organizers.

3175 NAKAMURA, N.
(Studies on male sterility in the onion. I. Cytological studies of the anthers of male-sterile plants).
Nyogo Noka Daigaku Kenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. 1954 : **1** : 118–22. [Japanese].
Anther development in male-sterile respresentatives of a normal and a viviparous variety of onion is described. In both cases male sterility is associated with failure of the tapetal cells to disintegrate at the tetrad stage.

3176 KOBABE, G.
Entwicklungsgeschichtliche und genetische Untersuchungen an neuen männlich sterilen Mutanten der Küchenzwiebel (*Allium cepa* L.). **[Ontogenetical and genetical investigations on new male-sterile mutants of the common onion (*A. cepa* L.)].**
Z. Pflanzenz. 1958 : **40** : 353–84.
At the Institute for Horticultural Plant Breeding, Hannover, the development of pollen grains

was studied in male-sterile American lines and male-sterile selections from the variety Zittauer Gelbe [Zittau Yellow]. The pollen grains were found to degenerate in a similar manner in the American and German material. Development was normal up to the formation of tetrads after which the cytoplasmic contents of the pollen grains died. In the sterile plants, the tapetum remained intact for a longer time than in male-fertile plants and the formation of the endothecium was delayed. It is thought that a delay in the transfer of nutrients from the tapetum to the developing pollen grains is responsible for the degeneration of the latter. In two samples of Zittauer Gelbe, the proportion of male-sterile plants was 1 and 2·9% and thirteen sterile plants were found in about 500 offspring obtained by selfing whereas in Stuttgarter Riesen [Stuttgart Giant], only one male-sterile plant was found amongst the large number examined. The inheritance of male sterility in Zittauer Gelbe appeared to be similar to that of the American forms; it depends on the interaction of a cytoplasmic factor and a nuclear gene, *ms*. Some complementary plants with normal cytoplasm and the genotype *ms ms* were discovered and a series of complementary lines were obtained by self pollination. The frequency of *ms* is relatively high in Zittauer Gelbe. Male-sterile plants of this variety are more valuable for the production of F_1 seed in Germany than the American lines which are not adapted to German conditions.

3177 Salokangas, K.
Sipulin säilytyksestä. (On the storage of onions).
Maatalous ja Koetoiminta 1956 : **10** : 186–95.

Optimum temperature and humidity requirements during storage for different varieties of onions and shallots are reported.

3178 Khoshoo, T. N. & Sharma, V. B.
Structural hybridity in *Allium ochroleucum*.
Curr. Sci. 1959 : **28** : 26–28.

Root-tip cells of *A. ochroleucum* were consistently found to have $2n = 19$, 13 of the chromosomes being metacentric and the remaining 6 telocentric. Meiotic investigation indicated that the species is a structural heterozygote, fragmentation, segmental interchange and inversion having been responsible for its evolution.

3179 Grun, P.
Variability of accessory chromosomes in native populations of *Allium cernuum*.
Amer. J. Bot. 1959 : **46** : 218–24.

A small type of B chromosome, lacking visible constrictions and presumed to be telocentric, has become established in native populations of *A. cernuum* in Pennsylvania and West Virginia [cf. 990]. Accessories smaller or considerably larger than this standard type were also seen in a few populations. One population contained B chromosomes with a metacentric constriction. All the accessories were euchromatic. During mitosis, the metacentric type underwent normal disjunction. Other accessories showed a strong tendency towards nondisjunction, so that variability occurred in each plant in the number of accessories in the same and different root tips, as well as in the microsporocytes. At metaphase I accessories were unpaired, and during anaphase I passed at random to the poles or lagged and formed micronuclei. At anaphase II, they usually underwent normal equational division, laggards being low in frequency. Eleven out of the 14 populations analysed contained accessories, the percentage of plants with such chromosomes ranging from 10 to 48%. No relationship was found between B-chromosome frequency and ecological conditions. The characteristics of accessories in *A. cernuum* are compared with those reported in other plants and several factors possibly responsible for the maintenance of these chromosomes in *A. cernuum* are discussed.

3180 Imazu, T. & Osawa, T.
(Studies on *Aralia cordata*. II. On the dormancy of the seeds of cultivated and wild forms of *A. cordata*).
Engei Gakkai Zasshi/J. hort. Ass. Japan 1958 : **28** : 149–53. [Japanese].

Marked intervarietal differences in period of dormancy were noted in a collection comprising 19 cultivated and 27 wild samples.

3181 Ellison, J. H. & Schermerhorn, L. G.
Selecting superior asparagus plants on basis of earliness.
Proc. Amer. Soc. hort. Sci. 1958 : **72** : 353–59.

Plants selected on the basis of five or more large spears produced by the first day of harvest outyielded the controls by 42–94%. For individual plants in three distinct populations, positive correlations were obtained between early yield, as measured by the first two weeks

of harvest, and total yield. These correlations were found with respect to single years and also to cumulative, early and total yields for periods up to six years. It is suggested that plants should be selected for breeding or seed production on the basis of a high number of large spears produced by the beginning of harvest. This method should be much simpler than selection according to yield records, and as effective. A small proportion of ♀ plants was obtained among the selected individuals, because females generally emerged later than males. In order to select a larger percentage of early females, the sex of the plants should be identified the previous season. Such information would permit the breeder to use one standard of earliness in selecting males and another standard in selecting females.

3182 Rohde, R. A. & Jenkins, W. R.
Basis for resistance of *Asparagus officinalis* var. *altilis* L. to the stubby-root nematode *Trichodorus christiei* Allen 1957.
Bull. Md. agric. Exp. Sta. 1958 : No. A–97 : Pp. 19.

The resistance of the asparagus variety Mary Washington to attack by *T. christiei* was shown to be due to a glycoside of low molecular weight exuded by the root.

3183 Patman, J.
Morphological variation in the genus *Brassica*.
Proc. Ia. Acad. Sci. 1958 : **65** : 86–95.

Variation in pod characters, leaf attachment and degree of pubescence in *B. napus*, *B. rapa*, *B. juncea*, *B. kaber*, *B. nigra* and *B. hirta* was studied in relation to distribution in the USA. In *B. rapa* some evidence of clines extending southward from the Great Lakes and eastward from the Pacific was obtained. A diagonal trend in variation in *B. juncea* suggests that this species was introduced in the New England area. *B. nigra* and *B. kaber* showed no distinguishable pattern of variation and the material of the other two species was insufficient for analysis.

3184 Wiering, D.
Kunstmatige bestuiving bij koolgewassen. (**Artificial pollination in *Brassica* crops**).
Zaadbelangen 1958 : **12** : 379–81.

Self pollination is most effective if carried out in the bud stage, two to three days before opening. A rapid method of removing the outer parts of the bud and exposing the style and stigma involves the use of a pair of small scissors, in each blade of which a small sharp-edged semicircular opening has been filed about 5 mm. from the tip, such that when the scissors are closed a hole about 1 mm. in diameter is present. The scissors are also useful in cross pollination of cauliflower, which is normally largely self-pollinating, or for plants in which insect pollination does not entirely exclude selfing. Treatment is performed on buds one day before opening. The use of the scissors does not effect complete emasculation, but if crossing is carried out immediately, fertilization should have taken place before the self pollen is ripe. It is suggested that pollination should not be attempted until 30% of the flowers are out, since the early flowers often give bad sets. Temperatures should be between 10° and 20° C. and the flowers should be protected by paper bags.

3185 Ušakova, E. I.
(**The production of hybrid seed of vegetables and cucurbits**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. 4 : 22–26. [Russian].

This article, dealing mainly with methods of seed production at Gribovo, mentions a heterotic hybrid of cabbage and two of cucumber bred there. The cabbage hybrid, Braunschweig 423 x Amager 611, shows a high degree of heterosis for yield by comparison with both parents, but the yield increase is greatly offset by its inferior quality; it is inferior to Amager 611 in keeping capacity and quality and does not make such good sauerkraut as Braunschweig 423. The cucumber hybrid Vjazniki x Nerosimyj [Rainfed] outyields the parental varieties by 30–40%, but is less suitable for salting than the first-mentioned parent and its transportability and salad quality are below those of the other.
The cucumber Klinskij x Vorgebirgs [Foothill] greatly surpasses Klinskij in yield and quality of fruit when sown under glass late in January; but Klinskij is more vigorous and productive than the hybrid when sowing is carried out in December.

3186 Shimizu, S., Kanazawa, K. & Kobayashi, T.
(**Studies on breeding *Brassica pekinensis* for resistance to soft rot. I. Intervarietal differences in disease resistance under natural conditions**).
Nogyo Gijutsu Kenkyusho Hokoku/Bull. Nat. Inst. agric. Sci. : Ser. E : 1958 : No. 6 : 75–108. [Japanese].

The degree of resistance of 82 varieties to soft

rot caused by *Erwinia aroideae* or *E. carotovora* was investigated during 1952–5. Four varieties were classed as resistant in both autumn and spring: Shimayamachitose [Shimayama Millenium], Matsushimakairyo 1 [Matsushima Improved 1], Taibyosei 1 [Disease Resistant 1] and Kairyochibakashin [Improved Chiba Kashin].

3187 Martin, P. G.
Temperature-induced reversal of dominance of variegation in 'ornamental kale'.
Experientia 1959 : **15** : 34–35.

Brassica oleracea 'Ornamental Kale' has leaves which become variegated during the winter in south Australia; in spring the white parts become green. There is considerable variation in the extent of the white tissue and in the date when it appears. In general an early appearance is correlated with a large amount of white tissue and *vice versa*.

A cross was made at the University of Adelaide between a plant true breeding for extensive and early variegation and a broccoli variety, Yates Green Sprout. Meiosis in the F_1 appeared to be normal. Six F_1 plants from each reciprocal cross were planted out in the field in mid April 1955 and all showed variegation within three days of 2 June; the extent of the variegation was uniform in all the plants.

Other plants from the same cross were divided into two groups; one set was given a natural photoperiod of 10–11½ hr. and the other set had a photoperiod of 18 hr. In each case, half the plants were grown in the glasshouse and half outside. A long-day treatment increased the growth rate but had no effect on the date when variegation appeared. Those plants grown outside the glasshouse showed variegation about one week after their sibs in the field whilst plants raised inside were still without variegation on 13 July. When variegated plants were brought into the greenhouse, they soon lost their variegation. Plants raised in the greenhouse showed variegation 14 to 18 days after being placed outside. Control plants which were not moved showed no change in colour. It is concluded that variegation is a response to temperature but the critical temperatures are uncertain. The temperature in the glasshouse was 21° C. and outside the temperature ranged between a mean daily maximum of 13·2° C. and a mean daily minimum of 7·7° C.

An F_2 family had 73 variegated and 25 nonvariegated plants; a back cross to broccoli yielded 26 variegated and 22 nonvariegated plants. This indicated that variegation is controlled by a single gene, the allele for variegation being dominant over the allele for nonvariegation. There seems to be a gene dosage effect for whilst the variegated back cross and F_1 plants always showed the less extreme forms of variegation, the most marked expression of this character was found in true-breeding types. During 1954 a sample of the F_2 family had yielded 31 variegated and 25 nonvariegated plants and a back-cross family had 10 variegated and 20 nonvariegated plants. It appeared that the variegated character was expressed in only a proportion of the heterozygotes in this season, which differed from 1955 in having higher temperatures in May.

A sample of this F_2 family was also sown in November 1956; the ratio of variegated to nonvariegated plants was approximately 1 : 3. It seems probable that the variegated plants were homozygotes and the variegated character was not expressed in the heterozygotes. During summer variegation was apparently recessive.

3188 Norman, R. G.
The importance of variety in Brussels sprouts.
Agriculture, Lond. 1959 : **65** : 23–25.

A brief discussion of characters desired in varieties grown for different purposes in Great Britain is followed by comments on the performance of some of the chief established commercial varieties, as well as of some of the newer varieties developed in England and the Irish Republic.

3189 Sneep, J.
Enige aspecten van de veredeling bij spinazie (*Spinacia oleracea* L.) [**Some aspects of breeding in spinach (*S. oleracea* L.)**].
Genen en Phaenen 1958 : **3** : 48–50.

The substance of this paper has been summarized from other sources [619 and 810].

3190 Dressler, O.
Zytogenetische Untersuchungen an diploidem und polyploidem Spinat (*Spinacia oleracea* L.) unter besonderer Berücksichtigung der Geschlechtsvererbung als Grundlage einer Inzucht-Heterosis-Züchtung. [**Cytogenetical investigations on diploid and polyploid spinach (*S. oleracea* L.) with special consideration of the inheritance of sex as the basis of inbred-heterosis breeding**].
Z. Pflanzenz. 1958 : **40** : 385–424.

These studies were conducted at the Institute of

Horticultural Plant Breeding, Hannover. In the chromosome complement of spinach, four subtelocentric chromosome pairs were found; the chromosomes of one of these pairs have satellites. There are also two pairs of large chromosomes with submedian centromeres and one of these pairs comprises the sex chromosomes, which can be distinguished from the other submedian pair by their slightly larger size and secondary constrictions. Also the Y chromosome differs from the X chromosome in having a satellite. Using these findings, it is possible to determine the sex chromosomes present in different sexual types during early stages of development.

Cytological analyses were carried out on progenies resulting from selfings of diploids and tetraploids and crosses within and between the two groups; the material included male and female plants and monecious types differing in the percentage of female flowers produced. The following sexual genotypes were found: female, XX, XY, XXX, XXY, XYY, XXXX, XXXY, XXYY, XYYY; monecious, XX, XY, YY, XXX, XXY, XYY, YYY, XXXX, XXXY, XXYY, XYYY, YYYY; and male, XY, YY, XXY, XYY, YYY, XXXY, XXYY, XYYY, YYYY.

These results indicate that genes on the autosomes also play an important part in determining sex; they interact with sex-determining genes on the heterosomes to produce the different monecious types. It is suggested that in the monecious condition the sex-determining genes on the autosomes are unbalanced whereas in the diecious condition they are balanced. The Y chromosome appears to have a greater effect than the X chromosome. In diecious plants, the presence or absence of the Y chromosome results in the development of a male or female plant, irrespective of the number of X chromosomes present. In monecious plants, the Y chromosome has a male-producing influence.

In other experiments, no inbreeding depression was observed, the differences in performance between inbred lines being the result of selection. Neither a reduction in germinating capacity nor chlorophyll defects were observed in inbred generations.

3191 Canham, A. E.
Lettuce varieties for soil-warmed hotbeds.
Tech. Rep. Brit. electr. allied Industr. Res. Ass. 1958 : No. W/T35 : Pp. 8.

A report is given of trials carried out for four seasons by the British Electrical and Allied Industries Research Association to compare varieties for suitability to the above method of cultivation. Only three varieties showed promise as alternatives to the hitherto standard hotbed variety Gotte à Forcer, which is not altogether satisfactory in respect of earliness and size. These varieties were Gotte à Graine Blanche, Cheshunt Early Ball and Cheshunt 5b.

3192 Thompson, R. C., Whitaker, T. W., Bohn, G. W. & Van Horn, C. W.
Natural cross-pollination in lettuce.
Proc. Amer. Soc. hort. Sci. 1958 : **72** : 403–09.

A report is given of the results obtained from several different plot arrangements in field plantings at the Yuma Experimental Farm, Ariz., and Southwestern Irrigations Field Station, Brawley, use being made of a green-leaved, white-seeded stock as the ♀ tester and a red-leaved, black-seeded stock as the pollen source. The results indicated the possibility of a low percentage of cross pollination between varieties or breeders' lines when grown in close proximity. The risk of contamination by mechanical mixtures may also occur.

3193 Foster, R. E.
Disease resistance in lettuce sought by plant breeders.
Prog. agric. Ariz. 1958 : **10** : No. 2 : p. 5.

Five strains with good resistance to tip burn have been selected at the Horticulture Department of the University of Arizona. Work on transferring the resistance to downy mildew (*Bremia lactucae*) found in some nonheading types to heading varieties is under way. The tip-burn resistant lines are being crossed with the mildew-resistant types to combine resistance to both diseases. Use is being made of gibberellin to hasten flowering and thus speed up breeding under greenhouse conditions. Rib discoloration is receiving attention in a programme similar to that dealing with tip burn.

3194 Whitaker, T. W., Bohn, G. W., Welch, J. E. & Grogan, R. G.
History and development of head lettuce resistant to downy mildew.
Proc. Amer. Soc. hort. Sci. 1958 : **72** : 410–16.

A detailed account is given of the development of breeding lines resistant to downy mildew (*Bremia lactucae*) in California and at Weslaco, Tex. Resistance depends on a single dominant gene, derived from *Lactuca serriola* 'PI104854'. All the lines have complex pedigrees of successive back crosses, susceptible commercial varieties being used as the ♀ parents as the general

rule. Selections from crosses of susceptible commercial varieties with Grosse blonde d'hiver Bourguignonne [Large Fair Winter Burgundian], which also possesses a dominant gene for resistance, proved to be inferior horticulturally and were discarded at an early stage in the programme.

3195 Schnathorst, W. C. & Bardin, R.
Susceptibility of lettuce varieties and hybrids to powdery mildew (*Erysiphe cichoracearum*).
Plant Dis. Reptr. 1958 : **42** : 1273–74.

The resistance of numerous lettuce varieties and hybrids is tabulated. None of the crisp-type varieties are resistant. Arctic King and Big Boston (butterhead types), Salad Bowl (non-heading butter type) and Bath Cos were the only ones showing resistance.

3196 Honma, S., Peterson, C. E. & Wittwer, S. H.
Spartan 162—a slow bolting green Pascal celery.
Quart. Bull. Mich. agric. Exp. Sta. 1958 : **41** : 378–80.

Spartan 162 is an early celery combining satisfactory quality with a slow-bolting habit. The original plant from which the variety was developed was a green selection from a commercial field of Cornell 19 in western Michigan. Inbreeding was carried out for seven generations, in each of which the plants were subjected to low temperatures by means of early planting or cold storage, with selection for slow bolting.

3197 Tilkin, V. E.
Veredeling van witloof. (**Breeding Witloof chicory**).
Tuinbouwber., Leuven 1958 : **22** : 274–78, 290–92.

In preliminary studies conducted in Belgium, close correlations were found between the following pairs of characters during the first year of growth: diameter of the root neck and root weight; number of leaves and leaf weight; and leaf weight and root weight. The interactions hairiness x leaf crinkling and leaf crinkling x leaf lobing were significant. Plants with crinkly leaves were about 25% heavier than those with smooth leaves and the presence of leaf lobes was associated with a greater number of leaves. Measurements of root and head characters have been made also after forcing and the relations between these values and those of the first year are being studied. A difficulty in breeding is the high degree of self sterility, which appears to be even more marked in plants grown in the isolation chamber than in those grown in the open. For the production of uniform populations, multiplication by root cuttings is recommended.

3198 Egorova, G. S.
(New standard varieties of cucurbits).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 1 : 30–32. [Russian].

Some outstanding varieties of melon, water melon and pumpkin still under trial are named and a few new standard varieties of water melon and pumpkin are described. The water melons Samarkandskij Belyj [White Samarkand], Stalingrad and Bykov 23 are all highly productive of fine-quality fruit. The last mentioned variety is a mid-season type of good transportability; the other two are early, Samarkandskij Belyj being drought resistant and a good keeper.

The pumpkins Plov-kėdy Mestnaja [Local Plov-kėdy], originating from Turkmenia, Plastunka, developed at Krasnodar, and Baškir 245 are high-yielding midseason table varieties. Hajvan-kėdy Mestnaja [Local Hajvan-kėdy], another Turkmenian strain, is a late forage variety of good keeping quality with a high yield, reaching in some years 600 c. per ha.

3199 Enslin, P. R. & Rehm, S.
The distribution and biogenesis of the cucurbitacins in relation to the taxonomy of the Cucurbitaceae.
Proc. Linn. Soc. Lond. 1958 : **169** : 230–38.

An account is given of the chemistry of the bitter principles (cucurbitacins) and their distribution both in the family and within individual plants. Studies at the Pretoria Horticultural Research Station have shown that seedlings of most cucurbit varieties are bitter, whether the fruits are bitter or not, and that the suppressing mechanism resulting in nonbitter fruits is governed by a single recessive gene in the water melon Hawkesbury, in the cucumber Early Fortune x Hanzil and in *Lagenaria siceraria*. The genes controlling interconversions are being studied in nonbitter forms of *Cucumis melo* and bitter forms of *Cucurbita pepo*; several lines differing greatly in enzyme activity have been found. All nonbitter plants in the F_2 and F_3 of bitter x nonbitter *Cucumis sativus* lacked elaterase activity, which hydrolyses cucurbitacin glycosides, while the bitter forms segregated into enzymatically active and inactive forms,

indicating that the genetic mechanism for elaterase formation is independent of the gene for fruit bitterness. *Citrullus* and *Cucurbita* generally lack elaterase activity even in the presence of bitter principles, apparently because they lack the gene or genes for elaterase formation.

3200 Dutta, S. K.
Groundwork for elucidation of the mechanisms of variation of pathogenicity of the fungus causing anthracnose of cucurbits.
Plant Dis. Reptr. 1958 : **42** : p. 1275.

Artificially induced mutants of *Colletotrichum lagenarium* (*Glomerella lagenaria*) were tested to find the relationship between biochemical requirements and pathogenicity. Those requiring isoleucine, serine, lysine, leucine and histidine appeared consistently nonpathogenic. Others were moderately or slightly pathogenic. All were obtained from the standard virulent race Z.

3201 Jurina, O. V.
(The melon variety Gruntovaja Gribovskaja 149).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 1 : 32–33. [Russian].

Gruntovaja Gribovskaja 149 [Outdoor Gribovo 149] which was obtained by vegetative-sexual hybridization and directed training at Gribovo, has reached the final testing stage in the provinces of Moscow, Orel and the Čuvaš ASSR. It is adapted to the climate of diverse regions in the Soviet temperate zone, has a growth period of 66–80 days and yields up to 500 c. per ha. The fruits weigh 0·5–3 kg. They have pale orange or white flesh with a strong aroma and a sugar content of 4–9%.

3202 Foster, R. E.
Breeding new disease-resistant cantaloup.
Progr. agric. Ariz. 1958 : **10** : No. 1 : p. 6.

Lines with a higher degree of resistance to crown blight than PMR450, the commercial variety showing the least susceptibility, have been bred at the Horticulture Department, University of Arizona. All require to be improved in horticultural characters. Inheritance of crown-blight resistance is complex. Arizona Sunrise, in particular, has proved valuable as a parent in breeding for resistance to this disease. Resistance to powdery mildew is also receiving attention.

3203 Belik, V. F. & Sinča, K. P.
(The effect of parental forms upon heritable properties of hybrid plants of cucurbits).
Naučn. Trud. Bykov. bahč. opyt. Stanc. (Sci. Trans. Bykovo Cucurbit Res. Sta.) 1957 : No. 4 : 125–33 [from: Ref. Ž (Ref. J.) 1958 : No. 3 : p. 38 : Abst. 9569]. [Russian].

The progenies of intervarietal hybrids of water melon and pumpkin at Bykovo resembled their maternal parent in respect of growth period, dry matter content of the fruits, resistance to *Fusarium*, fruit and flesh colour, consistency of the flesh and morphological characteristics of the seed.

3204 Usovskij, B. N.
(A bush water-melon).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 1 : p. 33. [Russian].

Kustovoj Desertnyj Korol' [Bush Dessert King] was obtained by inbreeding a form characterized by compact habit from the Texas Agricultural Experiment Station. Its yield is double or even treble that of standard varieties; in the shape, colour and flavour of the fruit and some other characteristics it resembles the standard variety Desertnyj Korol'.

3205 Babič, A. G.
(The cultivation of cucurbits in the area between the Volga and Ural river systems).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 12 : 32–33. [Russian].

A few high-yielding, large-fruited varieties of water melon are mentioned, also the water melon Handaljak, which is early, and Koj-Baš, which is late. The latter has sweet juicy flesh of crunchy consistency and yields up to 18 tons per ha. The fruits weigh 4–5 kg. each and keep and transport well.

3206 Shimotsuma, M. & Matsumoto, K.
(Comparative studies on the morphology of polyploid water-melon seeds).
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1957 : No. 8 : 67–74. [Japanese].

In continuation of an earlier report [XXVIII, 2483], comparative observations on the seeds of $2n$, $3n$ and $4n$ strains of water melon are reported. It was found possible to discriminate between the seeds of strains representing these three degrees of polyploidy on the basis of seed thickness or seed weight. The values for both these characters rise with increase in level of polyploidy.

3207 Shimotsuma, M.
Characteristics of watermelons collected in Afghanistan and Iran.
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1957 : No. 8 : 55–59.

The characteristics of water melons collected in Afghanistan and Iran and of the triploids obtained by crossing them with Japanese 4*x* varieties are described on the basis of observations at the Kihara Institute for Biological Research, Yokohama, Japan. The collections bore round or oblong fruits, with black, deep green or green pericarp, pink, yellow or white flesh and, in most cases, a nonsweet flavour. The results from the 4*x* x 2*x* crosses indicated that roundness was dominant over oblong shape, striping dominant over uniform colour, black pericarp completely or partly dominant over green, pink flesh dominant over red, yellow flesh completely or partly dominant over red, sweetness dominant over nonsweetness and the disease resistance of the Japanese varieties dominant over the susceptibility of the collections. Colour and sweetness probably depend on multiple factors.

3208 Tapley, W. T.
Red Skin—a processing squash.
Fm. Res. 1958 : **24** : No. 4 : 4–5.

Especially suitable for processing, Red Skin [(Knobby Leviathan x Golden Delicious) x Boston Marrow] produces oval fruits with moderately soft, red-orange skin and orange-yellow flesh uniform in thickness and high in quality.

3209 Schloms, M.
Zur Frage der unterschiedlichen Embryonalentwicklung nach reziproker Artkreuzung. Eine Untersuchung bei Riesenkürbis (*Cucurbita maxima* Duch.) und Gartenkürbis (*C. pepo* L.). (**The question of different embryonic development after reciprocal crossing of species. An investigation of *C. maxima* Duch. and *C. pepo* L.**).
Flora, Jena 1958 : **146** : 586–615.

A report is presented on the development of the embryo in *C. maxima*, *C. pepo* and reciprocal crosses between the two species; histochemical investigations on the developing embryos were also carried out.
The cross *C. maxima* x *C. pepo* is easily effected but only one case is known in which the reciprocal cross was successful. In this latter cross the endosperm of the fertilized ovules soon degenerates whilst in the cross of *C. maxima* x *C. pepo* the development of the endosperm is retarded but the tissue is not disorganized. The embryo of *C. pepo* x *C. maxima* ceases to grow after the 14th day of development.
The supply of nutrients to the embryo is discussed in relation to the results of these studies.

3210 Grebenščikov, I.
Notulae cucurbitologicae III. (**Notes on cucurbits. III**).
Kulturpflanze, Berlin 1958 : **6** : 38–60.

The inheritance of the dwarf character in *Cucurbita pepo* is discussed; this is considered to be a complex character. From the results of crosses between dwarf and vine types, it is concluded that the dwarf character is dominant and determined by polygenes, the number of genes involved being quite small. In some cases a segregation ratio of 3 : 1 for dwarf : vine was obtained, the dwarf forms being less bushy and the vine forms more bushy than the corresponding parents. There may therefore be one main gene and other modifying genes responsible for this character.
The genetics of fruit colour have also been investigated. The F_1 generation from PEP846 (white) x PEP1 (yellow) had white fruit, whilst in the F_2 the segregation was more complicated, all possible shades between white and yellow occurring. The ratios of nongreen : green in the F_2s were mostly close to 15 : 1. These results agree with Sinnott's hypothesis. A dominant gene *W* is responsible for white colour, this gene being epistatic over *Y* determining yellow colour; the double recessive *wwyy* genotype gives a green colour. In some crosses the ratio of nongreen : green was 3 : 1. The relationship between the *W* and *Y* alleles is still not clear.
The existence of an independent gene for the striped character as reported by Scarchuk was not confirmed but a dominant factor for mottled leaf, also reported by Scarchuk, was found [cf. XXV, 2466]. Various grades of mottling were noted in the *C. pepo* material investigated.
Convarieties of *C. maxima* are described and a key is provided for their determination. Also it is suggested that the convar. *citrullina* of *C. pepo* previously described by the author should now be convar. *pepo*. Three convarieties of *Lagenaria siceraria* are distinguished by their fruit form. As regards *Cucumis melo*, it is now thought that the *agrestis* forms and *cultus* forms should be placed in one species.

3211 Bodnenko, G. S.
(The best cucumber varieties for warm frames).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1959 : No. 1 : 19–20. [Russian].

Hybrids 221 and 34 were the most productive among varieties tested in the Ukraine. They yielded more fruit, including first fruits, than the standard variety Berlizovskij and their flavour was superior to that of the standard.

3212 van Koot, Y. & van Dorst, H. J. M.
De invloed van enkele virussen op de bloemvorming bij komkommer. (**The influence of some viruses on flower formation in cucumber**).
Tijdschr. PlZiekt. 1958 : **64** : 432–39.

Infection with *Cucumis* virus 1 resulted in an approximate doubling of the number of male flowers and halving of the number of female flowers, the effect being most marked when infection took place at an early stage of plant growth. Infection with *Cucumis* virus 2 or 2A had an opposite but less pronounced effect.

3213 Nakamura, N. & Terabun, M.
(Studies on artificial male sterility. II. Male sterility induced in the cucumber by application of a chemical).
Hyogo Noka Daigaku Kenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. 1955 : **2** : 44–46. [Japanese].

Treatment with 50 and 100 p.p.m. of the amine salt of 2,4-D caused a decrease in the number of male flowers and an increase in the number of female flowers. Pollen germinability was unaffected. [Cf. 3239.]

3214 Nuttall, V. W. & Jasmin, J. J.
The inheritance of resistance to bacterial wilt (*Erwinia tracheiphila* (E. F. Sm.). Holland) in cucumber.
Canad. J. Pl. Sci. 1958 : **38** : 401–04.

The bacterial-wilt resistance of PI200818 was dominant over the susceptibility of Marketer and dependent on a single gene.

3215 Akai, S. & Terasawa, H.
(Intervarietal differences in the resistance of cucumber to *Glomerella lagenaria* and the behaviour of the fungal pathogen during infection).
Nihon Shokubutsubyori Gakkai Ho/Ann. phytopath. Soc. Japan 1957 : **22** : 113–18. [Japanese].

The most resistant varieties observed after inoculation in a comparative trial were Tsudasanjaku [Tsuda Three Shaku*], Sekino 2, Taiwankema, a wild cucumber and Sakatapikkuru [Sakata Pickle]. Resistance appeared to be associated with difficulty in epidermal penetration.

3216 Akai, S., Yasumori, H. & Terazawa, H.
On the resistance of cucumber varieties to anthracnose and the behavior of the causal fungus in the invasion of the host tissues.
Plant Dis. Reptr. 1958 : **42** : 1074–79.

The incidence of and causes underlying resistance to infection by *Colletotrichum lagenarium* (*Glomerella lagenaria*) of cucumbers and squashes are discussed. Comparative data are given for susceptibility of a large number of cucumber varieties. The most resistant are Tsudasanjaku, Sekino 2, Taiwan Kema and wild cucumber. All squashes are highly resistant. [Cf. 3215]

3217 Herold, F. & Bremer, H.
Untersuchungen zur Epidemiologie, Ökologie und Bekämpfung des Gurkenmosaikvirus. (**Investigations on the epidemiology, ecology and control of the cucumber mosaic virus**).
Gartenbauwiss. 1958 : **23** : 254–74.

These studies, carried out at Neuss-Lauvenburg, Germany, revealed that the pickling cucumbers Delikatess and Delikatess Robusta are fairly tolerant of the mosaic virus; a high degree of tolerance was shown by Yorkstate Pickling, Ohio MR17 and the American snake melon Niagra.

3218 Höjby, H. R.
Nelmark and Nelcan: new varieties being improved even further.
Fmg. in S. Afr. 1959 : **34** : No. 12 : p. 31.

Respectively suitable for the fresh market and canning, the tomatoes Nelmark and Nelcan have been developed at the Citrus and Subtropical Horticultural Research Station, Nelspruit, Eastern Transvaal. Both are resistant to *Fusarium* wilt and high in yielding capacity. Nelmark is outstanding as regards freedom from blemishes and cracking resistance. It has the defect of small fruits, the majority of which are 1½–2 in. in diameter. Its yield of marketable fruit has however compared favourably with the yields of varieties such as Marvel, Manalucie, Southland and Sunneva. A deeper red colour of the flesh and less juice are required in Nelcan. Nelmark was selected from a natural cross between San Marzano and possibly

* 1 shaku = 0·994 ft. = 30·3 cm.

the wilt-resistant variety Manahill. Nelcan is a derivative of a round-fruited, fresh-market type (1662) and San Marzano. Breeding is under way to improve both varieties.

3219 Stevenson, E. C. & Tomes, M. L.
The commercial potential of the dwarf tomato.
Proc. Amer. Soc. hort. Sci. 1958 : **72** : 385–89.

Five dwarf lines were compared at Purdue University Agricultural Experiment Station in a trial at two spacings (4302 and 19360 plants per acre), with Urbana as control. The lines were developed as follows. The gene *d* for dwarfing was extracted from crosses between Dwarf Stone and wilt-resistant selections derived from progenies involving *Lycopersicon pimpinellifolium* 'Accession 160', Indiana Baltimore and Rutgers in their parentage. The dwarf, wilt-resistant lines isolated had good fruit size and quality but extremely poor fruit set. They were therefore crossed with Firesteel and Ontario to eliminate this defect, productive dwarf lines thus being obtained. These lines have very short internodes so that the fruit clusters are close together; the plants are upright and compact. At the higher rate of planting, two of the dwarf lines gave a yield of about 12 tons per acre at the first picking and total yield of over 30 tons. The commercial value of the dwarf lines and their possible utilization in mechanical harvesting are discussed.

3220 Lee, A. E.
Comparative growth of excised tomato roots of clones carrying dwarf and normal alleles.
Amer. J. Bot. 1958 : **45** : 744–48.

As indicated by measurements of the length of the main axis and number of laterals, growth of excised roots carrying the normal gene wd^+ exceeded that of root cultures from plants containing the "wilty dwarf" allele *wd* [cf. XXIII, 750] by 25% or more. The fresh weight of wd^+ roots was greater than that of *wd* roots, but for a comparable period of culture the dry weights of the two types were similar. Roots with *wd* produced more total N in proportion to dry weight than wd^+ roots. Measurements of epidermal-cell lengths at specific distances from the apex were similar in *wd* and wd^+ roots. These results, together with preliminary observations on roots carrying d^x for dwarfness and the normal allele, are interpreted as providing evidence that the effect of a mutation influencing growth may be extended to a specific organ isolated from the intact plant. The possible nature of the advantage in growth of wd^+ roots is discussed.

3221 Lee, A. E.
The effects of various substances on the comparative growth of excised tomato roots of clones carrying dwarf and normal alleles.
Amer. J. Bot. 1959 : **46** : 16–21.

Excised tomato roots, some carrying the *wd* gene for dwarfness and others with the corresponding normal allele wd^+, were cultured under various conditions at the University of Texas. It was found that a 2% sucrose solution is optimum for both kinds of root but *wd* roots appeared to be relatively more tolerant than wd^+ roots to higher sucrose concentrations. Growth was not improved in either *wd* or wd^+ roots by the addition of yeast extract, casein hydrolysate, 1,3-diphenylurea or a combination of the last two substances to the standard medium. The wd^+ roots grew better in the light than in the dark whilst the growth of the *wd* roots was favoured by the dark. The addition of indole-3-acetic acid to the medium did not stimulate the growth of either type; there was some indication that *wd* roots are more tolerant than wd^+ roots of low concentrations but both types of root were inhibited by high concentrations. Concentrations of 10^{-7} g./ml. eosin and higher were inhibitory to both *wd* and wd^+ roots but a concentration of 10^{-9} g./ml. decreased the growth rate of *wd* roots and increased that of wd^+ in both the light and the dark. Antiauxins reduced the growth of both *wd* and wd^+ roots. It is concluded that although there may be some differences in auxin metabolism between the roots, it is unlikely that this is the cause of dwarfism in the *wd* roots. Kinetin stimulated the growth of both *wd* and wd^+ roots at a concentration of 1·0 γ/l. Gibberellic acid in relatively high concentrations inhibited both types of root; at low concentrations it had little effect on *wd* roots but was inhibitory to wd^+ roots. Therefore these substances are apparently not the cause of dwarfism in *wd* roots.

3222 Oprișor, N.
Rezultatele experiențelor pentru stabilirea celor mai bune combinații hibride la tomate, în cultura neirigată la Copou-Iași. (**The results of experiments to establish the best tomato hybrid combinations for unirrigated culture in Copou-Iași**).
An. Lucrăr. ști. Inst. agron. Ion Ionescu de la Brad Iași 1957 : 157–74.

Trials involving 84 hybrids are reported. The

highest yielding combinations included Imun [Immune] x Budenovka, Imun x Inimă de bou [Bull's Heart], Earliest of All x Regina timpurilor [Queen of the Earlies], Earliana x Inimă de bou and Lucullus x Humbert. The largest fruits were found in Plovdiv 14 x Inimă de bou. Combinations heterotic for earliness included Olandeze [Dutch] x Bison, Imun x Inimă de bou and Imun x Bison. Dry-matter content was highest (6·3%) in John Baer x Budenovka and acidity in Inimă de bou x L71. Disease resistance tended to be high in offspring of Imun.

3223 Höjby, H. R.
Utilization of hybrid vigour in tomatoes: possibilities and limitations.
S. Afr. J. agric. Sci. 1958 : **1** : 249–61.

Trials of F_1 hybrids and ordinary varieties at Nelspruit and Kaapmuiden, Pretoria, showed the hybrids to be capable of giving much higher yields of marketable fruit. At Nelspruit, the hybrids could be picked 5·4 days earlier on the average than the varieties. At Kaapmuiden, the hybrids were on the average only 2·1 days earlier in ripening. The varieties surpassed the hybrids in average fruit size at both centres. It is suggested that F_1 hybrids, in particular *Fusarium*-wilt resistant hybrids with San Marzano as one parent, would be valuable for the canning industry. At Nelspruit, 1662 x San Marzano gave no less than 262·7% higher yield of marketable fruit than the best variety, 1206. Possible methods of reducing the cost of producing F_1 seed are discussed.

3224 Kristof, P.
Rendement de quelques tomates hybrides F_1 en pleine terre. (**The yield of some F_1 hybrid tomatoes in the open**).
Rev. hort. suisse 1959 : **32** : 57–59.

Three hybrids popular in French-speaking Switzerland and another experimental hybrid were tested at Châtelaine, Switzerland. In 1958 the experimental hybrid gave the highest yield; it is also early.

3225 Soost, R. K.
Progenies from sesquidiploid F_1 hybrids of *Lycopersicon esculentum* and *L. peruvianum*.
J. Hered. 1958 : **49** : 208–13.

Produced with the aid of embryo culture, F_1 plants from 4*x* *L. esculentum* x 2*x* *L. peruvianum* had $2n = 36$ and 10–15% stainable pollen. First and second generation progeny of the sesquidiploids were obtained from seeds produced in the field, probably as the result of open pollination by *L. peruvianum*, and grown without embryo culture. Chromosome numbers ranged from 26 to 34 in the first generation and, except for one plant with $2n = 40$, from 24 to 32 in the second generation. The high degree of pollen sterility of the sesquidiploids and the inability to effect back crosses of them by using *L. esculentum* pollen prevented the development of an aneuploid line of the *L. esculentum* type for breeding purposes.

3226 Hagemann, R.
Somatische Konversion bei *Lycopersicon esculentum* Mill. (**Somatic conversion in *L. esculentum* Mill.**).
Z. VererbLehre 1958 : **89** : 587–613.

[Cf. 994].

3227 Rick, C. M., Thompson, A. E. & Brauer, O.
Genetics and development of an unstable chlorophyll deficiency in *Lycopersicon esculentum*.
Amer. J. Bot. 1959 : **46** : 1–11.

A single gene designated *gh* was found to determine a condition of variable chlorophyll deficiency. Two independent mutations exhibiting the same phenotype have been recorded at this locus. The cotyledons show partial chlorophyll deficiency and the first true leaves a mosaic of normal and chlorotic tissue; in later development, the mutant shows complete chlorophyll deficiency. The deficiency occurs at two levels, a white phase characterized by little or no chlorophyll and a yellow phase with about 5% of the normal chlorophyll content present in irregularly distributed chloroplasts. Islands of the normal green colour occur sporadically in the white or yellow tissue. No evidence of other genes being concerned with this deficiency has been obtained; the degree of chlorophyll development is greatly influenced by environmental factors. Most of the mutant seedlings die before maturity but those with sufficient chlorophyll set fruits after self or cross pollination. Most of the fruits remain white until mature when the normal yellow pigment appears in the epidermis but the inner parts of the fruit remain white. The occasional patches of green that develop on mutant fruits turn red when mature. Seeds from all parts of such variegated fruit give only *gh* progeny after selfing, indicating that the sporadic reversions to green are unlikely to be the result of mutation. Some structural modifications accompany the chlorophyll deficiency, these being most marked in the leaf lamina. Linkage studies indicated that *gh* lies between *hl* and *j* in group V.

3228 STUBBE, H.
Mutanten der Kulturtomate *Lycopersicon esculentum* Miller II. (**Mutants of the cultivated tomato, *L. esculentum* Miller. II**).
Kulturpflanze, Berlin 1958 : **6** : 89–115.

More mutants of the varieties Lukullus, Condine Red and Rheinlands Ruhm [Rhineland Fame] are described [cf. XXVIII, 2349]. The mutants are: *angustifolia*, upright, with somewhat reduced height and shortened leaves, the development of side shoots being also reduced, leaf colour strongly affected by the environment and fruit ripening late; *arrecta*, short, forming a cylindrical bush, with reduced internodes, shortened leaves of a yellowish green colour when young and poor fruit and seed set with delayed fruit ripening; *attenuata*, small with shortened leaves and deformed leaflets, the yellowish green leaves having violet-coloured veins on the undersides, fruit set poor and fruit ripening late; *bicolor* short, the leaves being at first mottled with a brownish-olive colour later becoming dark green; *bullata* showing some reduction in growth but strong development of side shoots, the spotted leaves being slightly blistered on the upper surface and mainly yellowish green in colour; *cana*, very short, without side shoots the leaves being greyish green; *clausa*, with irregular leaves and additional leaflets in the axils of the lateral leaflets, very long petioles, foliage tinged with yellow and ripening delayed; *cochlearis*, small with weak development of side shoots, leaves having long petioles and usually only two pairs of leaflets of the first order, greyish-green in colour; *curvata*, reduced in size with the stem irregularly curved during early development, young leaves tinged with blue, later tinged with yellow; *declinata*, with all parts of the plant reduced in size, primary leaves rich in anthocyanin and the tip of the main shoot bending downwards; *deliquescens*, showing some reduction in growth, the leaves being relatively more reduced than the internodes, with strong development of side shoots and yellow tinging of the leaves; *depauperata*, dwarf, upright unbranched, leaves usually yellowish; *diminuata*, showing slight reduction in growth and some violet coloration, *discolor*, with light green leaves, the growing zone being yellowish; *divergens*, with the rachis greatly shortened, leaves of a yellowish grey-green colour, and the shoots well spread out; *erecta*, small, forming a spherical bush with early development of side shoots; *exilis*, very small with leaves varying between yellowish light-green and light olive in colour; *firma*, with reduced growth, wide firm leaflets having wrinkled upper surfaces and slightly notched margins; *flavida*, small and upright with sparse development of side shoots and narrow leaves of rather irregular form and yellowish coloration with some greenish-yellow mottling; *fructicosa hemiglobosa* forming a small hemispherical bush, with a compressed inflorescence and irregular fruits; *fusiformis*, showing some reduction in growth and forming a spindle-shaped bush during early development, the shiny leaves being tinged with yellow; *glaucescens*, smaller than the normal form, with weak development of side shoots, the leaflets being relatively wide and blunt and the colour varying between a mat green and yellowish grey-green; *gracilis*, upright and only 20–50 cm. in height, the side-shoot development being greatly reduced and the foliage light grey-green tinged with yellow; *ignava*, small, narrow and upright with reduced side-shoot development, leaves relatively large and of light green colour; *incurva*, small, forming at first a cylindrical bush, the shoots later separating out, and with irregular bending of the shoots, leaf veins, and inflorescence; *indiga*, with reduced growth and hardly any side shoots, terminal leaflets long and narrow, light grey-green in colour; *integerrima*, of almost normal size and the margins of the leaflets almost entire, terminal leaflets being enlarged; *introflexa*, with shortened internodes and forming a spherical bush, the leaves having leaflets inrolled above and being at first a mat grey-green and later lighter green and the rachis and stalks of the leaflets slightly violet in colour; *irregularis*, showing somewhat reduced growth and weak development of side shoots, the leaves being shortened and in some cases irregularly divided with irregular venation, foliage rather a dark green tinged with yellow; *minuta*, upright, small and almost unbranched, with firm light green leaves which turn yellow prematurely; *monstrosa*, with greatly reduced growth, the shortened leaves having only one or two pairs of leaflets, the leaves being somewhat rolled up; *nitida*, smaller than normal plants with long petioles; *notabilis*, yellowish green in colour, slightly hairy and susceptible to drought; *opaca*, with mature leaves of a mat-green colour; *pauper*, attaining a height of only 10–15 cm. with almost no lateral shoots and dark green leaves, beginning to die before fruit formation; *picta*, showing signs of degeneration in the seedling stage, the yellowish leaves having light brown necrotic spots irregularly distributed on the upper surfaces; *pulvinata*, with slight reduction in growth, forming a spherical bush,

the development of side shoots being strong; *relaxata*, small and of a loose growth habit, development of lateral shoots slight and terminal leaflets hanging downwards; *repens*, small and with a creeping stem, the mature leaves being brownish green; *reptans*, also of creeping habit with elongated internodes and yellow-tinged leaves; *robusta II*, with somewhat reduced internodes and leaves, the latter being sturdy and the leaflets greyish green tinged with blue; *ruptilis*, attaining about half normal size, light green leaves with dark veins and relatively large fruit ripening late; *squarrosa*, small, slightly branched with lateral-shoot development and internodes greatly reduced, greyish-green foliage, flowering delayed, fruit set poor and ripening late; *suffulta*, with a somewhat prostrate stem, the shortened leaves hanging downwards and yellowish in colour, anthocyanin in the stem, petioles and veins; *tabescens*, dwarf with whitish brown necrotic spots on the leaves, the veins being violet in colour, usually dies before flowering; *umbrosa*, small, leaves showing signs of wilt, fruit ripening delayed; *velutina*, upright and rigid, reduced in size, light green foliage; *versicolor*, somewhat reduced in size, young leaves of a faded yellowish green colour or mottled, later becoming almost normal in colour; *violacea*, showing a slight reduction in size, leaves a mat light-green, stem and veins violet in colour; and *vitiosa*, of normal size, with deformed and reduced leaves which are yellow and green when young, later becoming dark green.

3229 Boschi, G.
Oltre 1300 q.li per ettaro di pomodoro nel Parmense! (**Over 1300 quintals of tomatoes per hectare in the province of Parma**).
G. Agric. 1959 : **69** : p. 3.

In the third contest for tomato yields in the Parma province of Italy, all the prizes went to growers of the new varieties Pirro 59, Prospero 39 and Prospero 21, produced by the plant breeding institute at Bologna by selection from the variety Ladino da Panocchia.

3230 Lambeth, V. N.
The Mozark tomato.
Res. Bull. Mo. agric. Exp. Sta. 1958 : No. 680 : Pp. 8.

Mozark carries a single dominant gene for immunity from the prevalent form (race 1) of *Fusarium oxysporum* var. *lycopersici*, Mo. Accession 160 of *Lycopersicon pimpinellifolium* having supplied this gene. Named varieties entering into the complex pedigree of Mozark are Earliana, Break o' Day, Bison and Greater Baltimore. The variety matures earlier than Rutgers. Its ability to produce good yields during droughty summers is one of its most noteworthy characteristics, although part of this productiveness may be due to early set before the onset of high temperatures. Mozark shows promise as a parent in the development of wilt-resistant F_1 hybrids, its cross with Sioux having given an outstandingly good performance in tests during 1957.

3231 Lambeth, V. N.
The Mosage tomato.
Res. Bull. Mo. agric. Exp. Sta. 1958 : No. 681 : Pp. 7.

Like Mozark [cf. 3230], Mosage possesses immunity from race 1 of *Fusarium* wilt, derived from Mo. Accession 160 of *Lycopersicon pimpinellifolium*. Its other ancestors were Earliana, Break o' Day, Bonny Best and Rutgers. Recommended for domestic planting, this midseason and indeterminate variety may be grown out of doors or forced. It has sufficient vigour and heat tolerance to withstand droughty periods and to continue growth and fruiting until killed by frost. Its productiveness appears to be associated with large fruit and ability to set successive flower clusters.

3232 Gottschalk, W.
Untersuchungen über die Variabilität der Struktur von Pachytänchromosomen. (**Investigations on the variability of the structure of pachytene chromosomes**).
Ber. dtsch. bot. Ges. 1958 : **71** : 381–98.

At the Institute for Agricultural Botany of Bonn University, the morphology of chromosome 11 of *Lycopersicon esculentum* was studied during pachytene. Considerable variation was found in the total length of this chromosome and in the ratio of the length of the long arm to that of the short arm. It is however concluded that reliable information on this ratio can be obtained from the examination of a relatively small number of chromosomes provided that they come from as many different anthers as possible. The structure of the heterochromatic segment of this chromosome showed considerably less variation than the total length or the arm-length ratio.

3233 Gröber, K.
Multivalentbildung und "secondary association" in den Stadien der Meiosis autotetraploider Rassen der Gattung *Lycopersicon* Mill. (**Multivalent formation and secondary association in the meiotic stages of autotetraploid races of the genus *Lycopersicon* Mill**).
Kulturpflanze, Berlin 1958 : **6** : 198–236.

In the partially heterochromatic chromosomes of the tomato, it was observed that during zygotene the chromosomes first became paired at the telomeres and centromeres; the pairing then extended from the distal ends of the chromosomes to the centromeres. In more than 400 multivalents analysed, only one exchange between chromosome partners was found in each case; this occurred mostly at or near the centromere. The centralization of this exchange appears to be a result of the mode of pairing. The complete chromosome limbs function as pairing blocks and double partner exchanges cannot be distinguished.

Most of the multivalents observed during diacinesis were quadrivalents resulting from a single partner exchange; double exchanges led in most cases to the formation of bivalents. The number of multivalents per cell tended to increase during the period from diacinesis to metaphase I. In metaphase I, pairs of chromosomes were observed to be associated without being joined together. Also in later stages of development, associations of two and rarely more chromosomes were seen, agglutination having occurred in some cases during metaphase I. No secondary associations of the type described by Laurence were observed.

3234 Lee, A. E.
Variation in excised tomato root cultures.
Bull. Torrey bot. Cl. 1959 : **86** : 41–45.

Using White's standard medium, four excised-root clones of each of four highly inbred lines were established and measurements made of the length of the main axis at the end of four successive subcultures. Significant differences in growth were found between lines, between clones of the same line and between subcultures within a clone.

3235 Nickeson, R. L. & Currence, T. M.
Selecting for combining ability in a male-sterile tomato line having two recessive seedling genes.
Proc. Amer. Soc. hort. Sci. 1958 : **72** : 377–84.

A detailed report is given of investigations which have already been briefly described [cf. XXVIII, 3496].

3236 Hayslip, N. C.
Tomato breeding may solve graywall problem.
Res. Rep. Fla. agric. Exp. Sta. 1958 : **3** : No. 2 : 4–5.

Tests in southern Florida indicated that some varieties and breeding stocks were resistant to gray wall, apparently as the result of a heritable reaction. The development of resistant varieties is therefore considered to be the best means of overcoming the problem of this disease, which has been referred to as internal browning, vascular browning or blotchy ripening by other investigators. Evidence has been obtained that gray wall is not due to a virus.

3237 Schaffer, H. G.
Breeding a tomato variety resistant to *Didymella*.
Tomato Cucumber Mark. Bd. J. 1959 : **8** : p. 43.

An introduction of a wild species (unspecified) from Peru proved to be resistant to *Didymella* stem and fruit rot at the National Vegetable Research Station, Wellesbourne, England. The F_1 hybrid between the introduction and a commercial tomato inherited this resistance. Further work is in progress with the aim of combining the qualities of the commercial parent with resistance.

3238 McGuire, D. C.
The search for tomatoes resistant to tobacco mosaic virus.
Proc. Hawaii Acad. Sci. 1957 : **32** : p. 21.

In breeding resistant tomatoes at the Agricultural Experiment Station of the University of Hawaii, the most pathogenic strain available of the virus is used as inoculum and selection for resistance is made as late as possible, since resistant lines usually show no symptoms in the seedling stage. So far, the most resistant lines have not shown uniform resistance, in spite of repeated inoculations with a single specimen of plant sap on plants inbred for several generations.

3239 Nakamura, N.
(**Studies on artificial male sterility. I. Male sterility induced in the egg plant by application of a chemical**).
Hyogo Noka Daigaku Kenkyu Hokoku : Nogaku Hen/Sci. Rep. Hyogo Univ. Agric. : Ser. Agric. 1954 : **1** : 111–14. [Japanese].

Male sterility was induced by applying 10 p.p.m.

of the amine salt of 2,4-D. The ovaries were unaffected.

3240 Joshi, B. S., Singh, H. B. & Gupta, P. S.
Studies in hybrid vigour—III. Bhindi.
Indian J. Genet. 1958 : **18** : 57–68.

In investigations at the Indian Agricultural Research Institute, New Delhi, F_1 hybrids involving six varieties of *Hibiscus esculentus* were compared with their parents as regards plant height, fruit size, number of branches per plant, and number and weight of fruits per plot. Thirteen of the 29 combinations gave a greater weight of fruits per plot than their respective higher-yielding parents, while ten yielded less than the parents with the lower yields. Increased yield was mainly due to increase in fruit number. Cases of reciprocal differences were noted in all the characters studied. Long White Darbhanga exhibited the best general combining ability, its cross with Pusa Makhmali being the highest in yield, with a superiority of 51·3% over Pusa Makhmali, the local standard. In general, crosses between varieties with 5-edged and 8-edged fruits resulted in hybrids with higher yields than those within the 8-edged or 5-edged group. Male sterility would facilitate the production of hybrid seed on a commercial scale but so far its occurrence in this crop does not appear to have been reported.

3241 Esh, G. C., De, T. S. & Basu, U. P.
Influence of genetic strain and environment on the protein content of pulses.
Science 1959 : **129** : 148–49.

Investigations on *Cajanus cajan, Cicer arietinum, Phaseolus aureus, Ph. mungo, Vigna sinensis, Lens esculenta, Lathyrus sativus* and *Pisum sativum* at the Bengal Immunity Research Institute, Calcutta, showed both strain and locality to be important factors in influencing protein content.

3242 Bingefors, S.
Råproteinhalten hos trindsäd i försök vid Sveriges Utsädesförening. (**Crude protein content of pulses in trials at the Swedish Seed Association**).
Sverig. Utsädesfören. Tidskr. 1958 : **68** : 287–95.

In Swedish tests conducted during 1940–49 and 1952–55, decreasing protein contents were found in vetch, horse bean and pea, in that order, but horse bean gave the highest total yield of protein. Within the crops, intervarietal differences in protein content were small, but green cooking peas were generally superior to yellow, and the high-yielding fodder pea Bello had a rather low content. Marked variations according to year and locality were observed.

3243 Veldbonen, 1959. (**Field broad beans, 1959**).
Landbouwvoorlichting 16 : Bijl. 42; Ber. Rassenkeuze 1959 : No. 259 : unpaginated.

Data on agronomic characters and yields on different soil types are given for eight varieties grown in the Netherlands.

3244 Ueki, K.
(**Intervarietal differences in the reaction of flowering and fruiting in the broad bean to nocturnal temperature treatment. II. The influence of different nocturnal temperatures on the differentiation of the flower buds and maturation of broad-bean varieties**).
Kagawa Nogyo Semmongakko Kenkyu Hokoku/Tech. Bull. Kagawa Agric. Coll. 1956 : **8** : No. 1 : 19–24. [Japanese].

A comparative study of six varieties differing in maturation period showed that an increase in night temperature brought about an acceleration in flowering date and maturation date. The degree of acceleration depended on the variety, late varieties being most markedly affected.

3245 Smith, F. L.
Effects of plot size, plot shape, and number of replications on the efficiency of bean yield trials.
Hilgardia 1958 : **28** : 43–63.

The above problems were investigated by analysing uniformity trials of the varieties Red Kidney and Standard Pink. In order to attain a least significant difference of 200 lb. per acre, 6 replications were usually required and small plots less than 100 ft.^{2} could be effectively used with this number of replications. There was a slight but not significant advantage of narrow plots over wide plots. Replacing a randomized arrangement by a Latin square design was equivalent to adding 2 randomized replications.

3246 Campbell, J. A.
Longval.
Seed & Gdn. Merch. 1959 : **22** : No. 1 : 22–23, 32.

Developed at the Truck Crops Branch Experiment Station, Crystal Springs, Miss., Longval is a fresh-market type of bush snap bean belonging to the same general class as Stringless

Black Valentine and Contender. It has ranked high for yield in trials in the southern USA and consumer preference studies have shown it to be superior to these two varieties. Longval has a dual capacity in that it can also be sold in the pole-bean category if the pods are allowed to become overgrown. It was developed from a single-plant selection of line B1387–1–13–3–1, the parentage of which involved Great Northern Idaho 1, US 5 Mosaic Resistant Refugee Rogue, Stringless Black Valentine, World Fair and Commodore.

3247 LAMPRECHT, H.
Röntgen-Empfindlichkeit und genotypische Konstitution von *Phaseolus*. (**Susceptibility to X rays and the genotypic constitution of *Phaseolus***).
Agri. hort. genet. Landskrona 1958 : **16** : 196–208.

The results of preliminary experiments of some years ago involving X irradiation of soaked seeds are discussed briefly. In recent experiments, air-dried seeds of 11 lines were treated with dose rates of 8, 9 and 10 kg. r. The two primitive lines 53 and 61 showed most resistance to X rays; these lines carried the dominant genes of most of the gene pairs studied. Susceptibility to X irradiation was increased by the presence of the recessive genes *fin*, *y*, *fu*, *fb* and *st*. Plants grown from irradiated seed yielded less ripe seed than the untreated control plants; also many of the X plants did not complete their development.

3248 NAKAYAMA, R.
Genetical studies on kidney beans (*Phaseolus vulgaris*) II. On the inheritance of hypocotyl color. I.
Hirosaki Daigaku Nogakubu Gakujutsu Hokoku/Bull. Fac. Agric. Hirosaki Univ. 1958 : No. 4 : 80–87.

Data on crosses of Flageolet, Akasando, Kintoki 5 and Masterpiece as ♀, having pink hypocotyl, with Ekaki, a variety possessing green hypocotyl, are interpreted as follows. In addition to *P*, a basic factor for anthocyanin production, three gene pairs were involved in the inheritance of hypocotyl colour: Vv_{lae} for red *vs.* pink hypocotyl (and flower), as proposed by Lamprecht [cf. VI, 1435]; I_1i_1, the recessive allele of which inhibits *P*; and I_2i_2, the recessive member of which inhibits v_{lae}. The genotype $VV\ i_1i_1\ i_2i_2$ is assigned to Ekaki, and $v_{lae}v_{lae}$ $I_1I_1\ I_2I_2$ to the other varieties. The evidence also suggested that the homozygote $v_{lae}v_{lae}$ $I_2I_2\ i_2i_2$ had a zygotic lethal effect.

3249 NAKAYAMA, R.
(Genetical studies of French beans. I. On the inheritance of abnormal dwarfness).
Hirosaki Daigaku Nogakubu Gakujutsu Hokoku/Bull. Fac. Agric. Hirosaki Univ. 1957 : No. 3 : 26–29. [Japanese].

Dwarf habit, which appeared in the F_2 of the cross Akasando [Red Triple] x Honkintoki, was found to be determined by duplicate recessive genes designated dw_1, dw_2.

3250 HONMA, S. & HEECKT, O.
Bean interspecific hybrid involving *Phaseolus coccineus* x *P. lunatus*.
Proc. Amer. Soc. hort. Sci. 1958 : **72** : 360–64.

The F_1 of *Ph. coccineus* 'PI176675' x *Ph. lunatus* 'Fordhook Bush' exhibited the hypogeal habit of germination, inherited from the former parent. In vegetative characters, the F_1 approached *Ph. coccineus*. The F_1 plants were self incompatible, but in the presence of insects set pods with viable seeds. F_2 segregation for germination habit ranged from epigeal to hypogeal, as described by Wall and York [cf. XXVIII, 1032]. Recombinations of pod characters and of flower colour and plant habit were noted in the F_2. Variation in the several characters studied in the F_2 suggested polygenic inheritance.

3251 NAKAYAMA, R. & FUKUJU, H.
(On chlorophyll mutants in segregating generations of intervarietal crosses of French beans).
Hirosaki Daigaku Nogakubu Gakujutsu Hokoku/Bull. Fac. Agric. Hirosaki Univ. 1957 : No. 3 : 30–34. [Japanese].

Paper-chromatographic analyses of the chlorophylls, xanthophylls and carotene content of albino, lutescent and *chlorina* mutants that arose in two crosses are reported.

3252 LAMPRECHT, H.
Weitere Studien über die *aphyllus*-Mutante von *Phaseolus vulgaris*. (**Further studies on the *aphyllus* mutant of *Ph. vulgaris***).
Agri hort. genet., Landskrona 1958 : **16** : 103–11.

The original *aphyllus* mutant was discovered in the X_2 generation of the wax bean Weibull's Express; the corresponding mutant gene is designated *aph*. This mutant has no foliage leaves other than the two primary leaves, above which the stem is much branched, the internodes being extremely short. Abnormalities occur in

the flower organs and the mutant is completely sterile.
From this material, a line heterozygous for the gene *Aph* was selected and crossed with a normal line of the Dutch variety Fruca. In the F_2 of the cross, *aphyllus* types were found, their characteristics being analysed in detail. Considerable variation was observed in the *aphyllus* plants with respect to the branching of the stem. These types differ from the original mutant in that branched stems arise from the points of origin of the cotyledons underneath the primary leaves. No tripartite leaves characteristic of *Phaseolus* were found; all the leaves are small and simple, being similar to bracteoles. Various deformities occur in the flowers which are sterile.
The gene *Aph* has shown monogenic segregation; it is not linked to the genes *Lo*, *Y*, *P* and *V*. Some *aphyllus* mutants have also arisen spontaneously.

3253 Lesse, B. M. (Jun.)
Identification of Asiatic species of *Phaseolus* by seed characters.
Amer. Midl. Nat. 1958 : **60** : 132–44.

A seed key, together with detailed descriptions of the seed, is provided for *Ph. aconitifolius*, *Ph. angularis*, *Ph. aureus*, *Ph. calcaratus*, *Ph. mungo*, *Ph. radiatus*, *Ph. scaberulus* and *Ph. trilobatus*.

3254 Tourneur, M.
L'ambérique et le mungo ne sont pas des *Phaseolus*. (**Ambérique and mung are not *Phaseolus*).**
Riz et Rizic. 1958 : **4** : 131–48.

The leguminous plants known as ambérique in Madagascar and the Mascarene islands, dâu xanh in Cambodia and Annam and mung or green gram in India have been assigned to various species of *Phaseolus*. On the basis of their morphological characters and in particular certain features of the first leaves, it is thought that these plants belong to the genus *Vigna* as already suggested by Wilzcek and Hepper. Also all these plants are thought to be of the same species which is designated *V. mungo*. Another plant originating from Saigon and previously designated *Ph. mungo* is also thought to be a species of *Vigna*, probably *V. sepiaria*.

3255 Atkin, J. D.
Relative susceptibility of snap bean varieties to mechanical injury of seed.
Proc. Amer. Soc. hort. Sci. 1958 : **72** : 370–73.

Varieties were tested for susceptibility to mechanical injury by dropping the seed 15 times from an endless belt on to a steel plate. The height of the drop was 28 in. and the endless belt was used so as to allow the seeds to drop and strike the plate individually. The varieties showed significant differences in susceptibility to damage by this treatment, as indicated by data on germination. The high degree of resistance of the white-seeded variety Streamliner indicates the possibility of breeding varieties resistant to seed injury incurred during threshing, milling and subsequent handling.

3256 Dean, L. & Hungerford, C. W.
Idaho Bountiful and Golden Gem snap beans resistant to mosaic and curly top.
Bull. Idaho agric. Exp. Sta. 1954 : No. 217 : Pp. 6.

In snap-bean breeding at the Idaho Agricultural Experiment Station, Corbett Refugee has been used as a source of resistance to common bean mosaic and a variant strain, and Burtner Blight-Proof as a source of resistance to curly top. Idaho Bountiful was developed by crossing a selection of (Red Valentine x Corbett Refugee) x Burtner Blight-Proof with Bountiful and back crossing once to the latter variety. Golden Gem was selected from a cross of a derivative of (Idaho Refugee x Corbett Refugee) x Burtner Blight-Proof with Early Wonder Wax. Both varieties are bush types producing beans of high quality for fresh use and processing.

3257 McGuire, D. C. & Allard, R. W.
Testing nematode resistance in the field.
Plant Dis. Reptr. 1958 : **42** : 1169–72.

Experiments performed in Hawaii for testing resistance of Lima beans to root-knot nematodes (*Meloidogyne* spp.) are described. Of five commercial varieties only Westan showed any marked resistance. Ten strains which had shown resistance in previous trials in California gave corroborative results with one exception, and the resistance of strain L136 was outstanding. Four H110 lines, representing families derived from resistant strain L76 crossed with susceptible Fordham, reacted similarly to the resistant parent. Subsequent tests indicated that these were homozygous for resistance.

3258 Ligon, L. L.
Characteristics of cowpea varieties (*Vigna sinensis*).
Bull. Okla. agric. Exp. Sta. 1958 : No. B–518 : Pp. 47.

The bulletin gives an identification key based on seed characters and descriptions of 142 varieties.

3259 Patil, G. D.
Anthesis and pollination in field wal (*Dolichos lablab*—Roxb.).
Poona agric. Coll. Mag. 1958 : **49** : 95–102.

Observations on anther dehiscence and pollination in *D. lablab* under conditions at the Agricultural Research Station, Igatpuri, Bombay State, are recorded. Details are given of the technique devised for artificial crossing.

3260 Probst, A. H. & Athou, K. L.
New soybean Lindarin adapted for Indiana.
Crops & Soils 1959 : **11** : No. 5 : p. 20.

Lindarin [Mandarin (Ottawa) x Lincoln] matures two days earlier than Harosoy and four days earlier than Hawkeye, and is higher in yield and oil content than these varieties. Erect in growth habit and medium in height, it is resistant to lodging. Less susceptible to *Phytophthora* root rot than Harosoy, it also shows only a low degree of susceptibility to stem canker. Like Harosoy, Lindarin is resistant to downy mildew and frog-eye leaf spot. Hawkeye is susceptible to all these diseases.

3261 Brim, C. A., Johnson, H. W. & Cockerham, C. C.
Multiple selection criteria in soybeans.
Agron. J. 1959 : **51** : 42–46.

"Selection indexes involving 15 combinations of oil, protein, yield, lodging, seed weight, and fruiting period were computed for 2 populations of F_3 lines of soybeans evaluated at 2 or 3 locations in the F_1 generation. Three price ratios of oil to protein (1 : 1, 1 : .6, and 1 : .2) were considered for each index.

"The advance expected in pounds of oil per acre, pounds of protein per acre and pounds of oil equivalent per acre were computed for all indexes and price ratios and from selecting the top 5% of the progenies. The advance in pounds of oil or protein for a given index was little affected by changes in price ratio in population 1, but in population 2, advance in oil increased and advance in protein decreased markedly as the relative price of protein decreased for indexes involving any two or all of the characters, oil, protein, and yield.

"Oil was the most important single character in population 1 and seed weight in population 2. The advance in pounds of oil equivalent expected from selection based on both of these characters was 101 and 113% of that based on oil, protein, and yield, and 84 and 95% of that based on all 6 characters in populations 1 and 2, respectively. Two easily measured characters, seed weight and fruiting period, were estimated to give 84 and 112% of the advance expected from oil, protein and yield in populations 1 and 2, respectively.

"Some general considerations on the use of indexes were discussed."

[Authors' summary].

3262 Caviness, C. E.
Soybean varieties recently released for Arkansas.
Arkans. Fm. Res. 1958 : **7** : No. 6 : p. 2.

The performance of Lee, Dorman, Jackson and Hood is discussed.

3263 Weber, C. R.
A new soybean—its Ford.
Iowa Fm. Sci. 1958 : **13** : No. 5 : 3–4.

Ford [(Lincoln x Richland) x Lincoln] is recommended as a substitute for Lincoln in the north-central and south-central areas of Iowa. It ripens slightly earlier than Lincoln, slightly later than Adams and a week earlier than Clark. Somewhat more resistant to lodging than these three varieties but similar in height, Ford is satisfactory for combining. In oil and protein content it equals Lincoln and Clark. Ford gave higher yields than Lincoln and Adams in 44 out of 49 tests in Iowa during 1951–57 and yielded more than Clark in about half of the tests.

3264 Dropkin, V. H.
Varietal response of soybeans to *Meloidogyne*—a bioassay system for separating races of root-knot nematodes.
Phytopathology 1959 : **49** : 18–23.

Information is presented on the interaction between 19 varieties of soya bean and three species and one variety of *Meloidogyne*. It was found that both galling and egg mass production were influenced by the host variety and the species of parasite; also the sex ratio of the parasite varied in different host-parasite combinations. A population of *M. incognita* var. *acrita* from California was distinguished from a similar population from Maryland by differential behaviour on two soya bean varieties.

Also the interaction between nine inbred lines of maize and several species of *Meloidogyne* was investigated.

3265 Skotland, C. B.
Bean pod mottle virus of soybeans.
Plant Dis. Reptr. 1958 : **42** : 1155–56.

A large number of soya-bean varieties were all found to be susceptible when inoculated with four collections of bean pod mottle virus. Three

varieties of cowpea were also inoculated, of which Dixie Lee was found to be resistant. Several bean varieties were also tested; all showed some reaction but no systemic infection was noted in Blue Lake, Michelite, Navy and Keeney Refugee.

3266 Pohjakallio, O. & Antila, S.
Eräiden soijalajikkeiden fotobiologisista ominaisuuksista. (**The photobiological characteristics of different varieties of soya bean**).
Maataloust. Aikakausk. 1957 : **29** : 113–20.

The responses of soya bean varieties Fiskeby 846–2–1, Fiskeby 843–15–4 and Pando to varying conditions of duration and intensity of illumination are examined, and effects on stages of development and pod and seed production are compared. The Fiskeby varieties are comparatively uninfluenced by short photoperiod. Low intensity of illumination reduces pod production in all three varieties. Some data are also given on yield of the varieties Manitoba and A90 in varietal trials at Viik to illustrate variation in performance with temperature in successive seasons.

3267 Kivi, E.
Kokemuksia hollantilaisista peltohernelajikkeista. (**Observations on Dutch field pea varieties**).
Koetoiminta ja Käytäntö 1958 : **15** : 1, 4.

A number of new Dutch field peas are compared with Kalle and Torstai II [Thursday II] for yield and cooking qualities. These flower at the same time as the earlier Scandinavian varieties but retain their culinary properties longer. The most outstanding for yield and flavour is Servo.

3268 Ronde groene erwten, 1959. (**Blue peas, 1959**).
Landbouwvoorlichting **16** : Bijl. 39; Ber. Rassenkeuze 1959 : No. 256 : unpaginated.

Brief descriptions are given of nine varieties together with data on their yields on different soils in the Netherlands.

3269 Schokkers, 1959. (**Marrowfat peas, 1959**).
Landbouwvoorlichting **16** : Bijl. 40; Ber. Rassenkeuze 1959 : No. 257 : unpaginated.

The varieties Big Ben, Emigrant and Zelka have been tested in the Netherlands since 1946. Zelka was less good than the others.

3270 Kapucijners en rozijnerwten, 1959. (**Dun peas and maple peas, 1959**).
Landbouwvoorlichting **16** : Bijl. 41; Ber. Rassenkeuze 1959 : No. 258 : unpaginated.

Tabulated data on yields on different soil types in the Netherlands are given for two dun and four maple pea varieties, together with notes on their agronomic characters.

3271 Lamprecht, H.
Eine *Pisum*-Mutante mit in diminutive Stammverzweigungen umgewandelten Infloreszenzen und ihre Vererbung. (**A mutant of *Pisum* with inflorescences changed into diminutive stem branches and its inheritance**).
Agri hort. genet., Landskrona 1958 : **16** : 112–29.

The mutant, designated *inflorescentia conversa*, occurred in three F_2 families of a cross between two different lines; it is characterized by the occurrence of reduced vegetative branches in the leaf axils instead of inflorescences; these branches have very short internodes. All the leaflets are more or less funnel-shaped at the base. The single recessive gene responsible for the mutant form is designated *inc*. Some of the mutant plants produced small flowers and subsequently seeds; the flowers were always terminally situated on the stems or branches. Although the parts of the flowers showed certain abnormalities, these were not of the degree that usually results in sterility. The pollen grains appeared to be normal; they showed a segregation of 3 yellow : 1 white.
Evidence was obtained of linkage between the gene *Inc* and the gene *Wb* of chromosome II. It seems probable that the mutant gene *inc* arose during reduction division in one of the parents of the mutants.

3272 Lamprecht, H.
Über grundlegende Gene für die Gestaltung höherer Pflanzen sowie über neue und bekannte Röntgen-Mutanten. (**On basic genes for the formation of higher plants, and on new and already known X-ray mutants**).
Agric hort. genet., Landskrona 1958 : **16** : 145–95.

This discussion is based on the results of a 30-year study of genetics, with special reference to *Phaseolus* and *Pisum*. The genes determining the form of higher plants are considered to be of four main types. Firstly there are the genes which determine the development of different parts of the plant; in this connexion

various mutants lacking certain organs are described. The recently studied X-ray mutant of *Phaseolus vulgaris, surculus reductus*, has a reduced shoot; growth proceeds normally up to the development of the first two leaves and then ceases. The gene responsible for this abnormality is designated *sre*; a similar mutant has also occurred spontaneously in a hybrid. The *solum folia* mutant of *Ph. vulgaris* appeared in an X_3 generation of the variety Stella; the corresponding recessive mutant gene is referred to as *sof*. This mutant produces two well-developed primary leaves and then, instead of shoots with leaves and inflorescences, only tripartite compound leaves develop from the growing point; about 30 such leaves are produced. Another mutant of *Phaseolus*, the *sine inflorescentis* mutant, arose in the F_3 of the cross [*Ph. coccineus* x (*Ph. vulgaris* x *Ph. coccineus*) x *Ph. vulgaris*]; monogenic segregation occurred, the recessive gene involved being designated *sif*. The mutant plants are about 20 cm. high whereas the normal plants are 35 cm. high; there is no trace of an inflorescence. In some leaf axils, very small tripartite leaves have been found; possibly the inflorescences are changed into leaves. A *sine inflorescentis* mutant has also been found in *Antirrhinum majus*. A mutant of *Pisum, sine floribus*, is characterized by the absence of flowers on at least some of the inflorescences; the bracteoles when present are large and asymmetrical. Once again a recessive mutant gene is responsible for the abnormality, this gene being designated *sif*. Since some of the mutant plants produced flowers, it is supposed that *sif* is either an unstable gene or of low penetration. Another X-ray mutant gene of *Pisum, siv*, is expressed by the absence of the standard petal [cf. XXVIII, 3527]. All the mutant genes so far mentioned bring about sterility. It is supposed that most of the higher plants carry the corresponding dominant genes. The second type of mutant discussed is that in which important parts of the plant are transformed into nonfunctional organs [cf. 3271 and 3274].

Thirdly the effects of the so-called interspecific genes are considered. Species of a genus often differ in respect of the alleles controlling certain characters. Occasionally mutants bearing an allele characteristic of another species have occurred spontaneously or as a result of X irradiation. Twenty-six such mutant genes are mentioned which cause changes in both the vegetative organs and the floral parts; the mutant plants are all sterile. This series of 26 mutants is classified into five subgroups. These are: (1) mutants with simple character changes, the differences between mutant and normal forms being such as are frequently found between closely related species; (2) mutants in which the leaf form is greatly changed, especially in respect of the ratio of length to breadth; (3) forms in which the length : breadth ratio of the leaves is altered in addition to other morphological changes; (4) mutants in which the whole habit of the plant is altered; and (5) mutants with simple, bipartite or tripartite leaves. It was observed that the degree of abnormality of the vegetative organs was correlated with that of the floral parts. Eight other interspecific genes are also mentioned; these determine alterations in the floral parts, so bringing about sterility; these particular genes do not affect the vegetative organs. No mutants were found which showed vegetative characters foreign to the species unaccompanied by sterility.

It is supposed that when a gene responsible for a specific vegetative character mutates to an allele foreign to the species, other genes responsible for transforming vegetative structures into floral parts are unable to act. It is also thought that mutation affects progenes rather than the genes themselves; progenes are substances necessary for the synthesis of genes.

Certain so-called intraspecific mutant genes which greatly influence the habit of plants are also discussed. For example *pyramidalis* mutants have been found in species of a number of genera, including *Acer, Betula, Carpinus* and *Pinus*; in all cases the mutant habit of growth is very similar. The genes responsible for this character in the different species are believed to be probably homologous.

3273 Blixt, S., Ehrenberg, L. & Gelin, O. **Quantitative studies of induced mutations in peas. I. Methodological investigations.**
Agri hort. genet., Landskrona 1958 : **16** : 238–50.

In order to investigate the influence of the genotype on the rate of mutation and type of mutation induced, two pea varieties differing in various characters were used in these experiments. The varieties were Weibull's 702, a yellow cooking pea, and the garden pea Witham Wonder, which has wrinkled seed; Witham Wonder is more sensitive to X rays than Weibull's 702 [cf. XXVIII, 4895]. Seeds of these peas were irradiated by 175 KV at a dose rate of 800 rad. min. Other samples were treated with ethylene oxide. A system was

devised for recording the precise position from which seed samples were taken on X_1 plants; branches were denoted by letters and pods by numbers. It was then possible to map the mutant regions of the X_1 plants, as shown by the production of X_2 mutants.

X_2 progenies were raised in the greenhouse; as soon as the seedlings were 5–10 cm. high, they were examined for the segregation of mutant types. In those cases where deviating types were found, the entire offspring of the mutated branch was raised to obtain seeds for an X_3 generation. In all the cases examined the mutant sector of the X_1 plant was restricted to one branch. Mutation rates were calculated for the different treatments, taking into consideration the number of X_1-branch progenies investigated. It is pointed out that this method of determining mutation rates in the greenhouse is less costly and requires less space than cultivating X_2 families in the field.

The mutants observed among X_2 seedlings included nine types with disturbances of pigmentation, five with disturbances of internode or leaf development and one with unusual geotropic reactions of root and stem. Various other abnormalities were noted but were not recovered in the X_3. Segregation data indicate a deficiency of heterozygotes in the X_2 for some of the mutant genes; the reasons for this are not yet known.

The treatments applied were able to increase the mutation rate about 100-fold in comparison with the spontaneous rate. Ethylene oxide, as compared with X rays, appeared to be equally efficient as a mutagenic agent for peas.

There was some indication that induced mutations occur more readily in Witham Wonder than in Weibull's 702. Whereas in Witham Wonder a high frequency of *compactum* mutants was observed, no mutant of this type was found in Weibull's 702.

3274 Lamprecht, H.
Eine *fruticosa*-Röntgenmutante von *Pisum*. (**A *fruticosa* X-ray mutant of *Pisum***).
Agri hort. genet., Landskrona 1958 : **16** : 130–44.

An X-ray mutant is described which has an average of 10 stems per plant, whilst normal plants have only 3 or 4. This character depends on the presence of the recessive genes *fr* and *fru* [cf. XXI, 2275]. The recessive gene *fru* was also found to cause a reduction in stem height of about 25% as compared with plants carrying *Fru*; also *fru* is responsible for a 20% reduction in the length of the pods. Moreover the first inflorescence develops at a lower node in *fru* plants than in *Fru* plants.

3275 Vaznonene, I. Ju.
(Pea varieties in the Lithuanian SSR).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1958 : No. **4** : 61–63. [Russian].

Two new varieties with high yield, great ecological plasticity and rich in protein are described. Grejtukaj was obtained by distant hybridization involving the Lithuanian green-seeded variety Žaljukaj and the Swedish variety Adoitiv, the latter having white seed. Grejtukaj has a growth period of 72–115 days and a protein content of 25·8%; it cooks well. Rajnjaj is a productive late-maturing forage type with a 3·45% higher protein content than Grejtukaj. It was selected from a local variety in the Rasejnjaj district.

3276 Blixt, S.
Cytology of *Pisum*. II. The normal karyotype.
Agri hort. genet., Landskrona 1958 : **16** : 221–37.

There are known to be several structurally different types of caryotype in *Pisum*. It is suggested that the well-studied caryotype of line 110 be considered as the normal type; this line has been investigated by Lamprecht in genetical analyses involving more than 30 crosses.

The cytological technique used in studying the chromosomes of line 110 has already been published [cf. XXVIII, 4893]. Details are presented of the morphology of the caryotype together with a key for identifying the seven mitotic chromosomes. Other investigations of the *Pisum* caryotype are also discussed. There is some evidence that the duplications in *Pisum* are of measurable size.

3277 Manner, R.
Studies on seed-setting in leguminous plants. I. Peas.
Maataloust. Aikakausk. 1958 : **30** : 143–57.

Many characters affecting seed yield were studied in a number of varieties and in early-generation hybrid material from intervarietal combinations at the Gullåker Plant Breeding Institute, Hammenhög, Sweden. Wide genetical differences were noted among the characters investigated.

3278 Lyall, L. H. & Wallen, V. R.
The inheritance of resistance to *Ascochyta pisi* Lib. in peas.
Canad. J. Pl. Sci. 1958 : **38** : 215–18.

Resistance of peas to *A. pisi* Lib. was investigated by means of crosses between the resistant variety Ottawa A–100 and the susceptible Thomas Laxton. The parent varieties, F_1 and F_2 were inoculated with a monosporous isolate of race II of the fungus. Segregation ratios indicate the presence of duplicate dominant genes, either of which will give resistance.

3279 Schroeder, W. T. & Barton, D. W.
The nature and inheritance of resistance to the pea enation mosaic virus in garden pea, *Pisum sativum* L.
Phytopathology 1958 : **48** : 628–32.

Selection G168 of PI140295 has shown resistance to pea enation mosaic virus (PEMV); this resistance, which is determined by a single dominant gene *En*, enables the plant to grow and reproduce even when systemically infected with PEMV. Resistant plants showed similar reaction to cultures of the virus from different pea-growing districts of the USA. Occasionally resistant plants inoculated in the greenhouse developed typical enation symptons at or after the flowering period. Viruses isolated from these plants were able to produce typical symptoms in other lines showing resistance to the normal strain of the virus; maintenance of the aberrant strain on susceptible pea plants reduced its virulence for the resistant lines. No aberrant strains have been found in the field. No linkage was found between *En* and *Le* in linkage group IV or between *En* and *R* in linkage group VII.

3280 Barber, H. N.
Physiological genetics of *Pisum* II. The genetics of photoperiodism and vernalisation.
Heredity 1959 : **13** : 33–60.

These investigations were conducted at the University of Tasmania using the four varieties Alaska (tall, early), Massey (dwarf, early), Telephone (tall, late) and Greenfeast (dwarf, late); a few experiments were also carried out with the late varieties Zelka and Unica.

The varieties fell into two distinct groups. The early varieties flowering at node 9 or 10 showed no response to photoperiod. Alaska also showed no response to vernalization. Massey showed a slight but significant negative vernalization effect, vernalized plants flowering at a higher node than nonvernalized plants. An apparent reduction in this negative vernalization with long photoperiod was not statistically significant. The late varieties and the F_1 hybrid between Massey and Telephone were both vernalizable and long-day plants; increasing photoperiod lowered the node of the first flower in an apparently almost linear manner in both vernalized and nonvernalized plants. Increasing the photoperiod from 8 hr. to 24 hr. lowered the position of the first flower by 8–12 nodes in nonvernalized plants; in vernalized plants, the response was lower, involving 5–7 nodes. Correspondingly the response to vernalization was greatest at the short photoperiods; at an 8 hr. photoperiod, this involved 5–8 nodes and at a 24 hr. photoperiod, 1–3 nodes. All interactions between vernalization and photoperiod treatments were highly significant. Zelka showed similar behaviour to the late varieties already discussed. Unica, tested under artificial light only, showed poor growth and the responses were smaller than in the other varieties, there being no significant interaction between photoperiod and vernalization treatments.

The effect of the temperature at which the plants were grown was studied using three varieties; the temperatures chosen were 10° C., 17° C. and 23° C. Artificial illumination was used. In unvernalized plants of Massey, there was a delay in flowering of about one node at 10° C as compared with the development at the higher temperatures; the effect was statistically significant. Prior vernalization seemed to remove the effect of the temperature at which the plants were grown. Telephone and Unica showed greater responses. Prior vernalization and long photoperiod reduced the effect of temperature; the lower the temperature, the less the effect of vernalization and photoperiod. It is concluded that vernalization in peas is a continuous process, not restricted to the early stages of growth. It was also found that photoperiodic induction is completely reversible in late varieties.

From the above results, it appears that the reactions to photoperiod and vernalization are competitive, a period of cold treatment partially replacing the necessity for exposure to long photoperiods. It is thought that this competitive system for the control of flowering is of greater adaptive value than a system of phasic development as suggested by Melchers and Gregory.

Segregation data from crosses between late and early varieties indicated that the late varieties have a dominant gene, *Sn*, which causes late flowering by inducing a response to photoperiod and vernalization. It is suggested that *Sn* is

responsible for the production of a flower-delaying substance colysanthin. This substance must be destroyed before flowering can take place; it is preferentially destroyed at low temperatures and during long photoperiods.
The gene *Sn* also raises the node at which the first leaf with four leaflets is produced and it slightly reduces the length of the stem.
There also appear to be two other gene systems influencing flowering. One of these modifies the action of the *Sn* gene and the other is a system of polygenes altering the node of the first flower by a physiological mechanism differing from that involving colysanthin.
Segregation at the *R* locus had no effect on flowering. There is some evidence that *Le* may be a modifier of *Sn*, *Le* causing a slight delay in flowering when associated with *Sn*. *Le* does not appear to have any effect on *sn*. [Cf. XXVI, 1914].

3281 Argikar, G. P.
Another case of interaction of factors in *Cicer arietinum* L.
Curr. Sci. 1959 : **28** : 34–35.

According to data from a cross between a small-leaved, tiny-seeded mutant (B) and a tiny-leaved mutant (A) having pods and seeds normal in size [cf. 881], the dominant genes *Tlv* and *Smlv* interact to produce normal leaves, while *Tlv* alone results in small leaves as in B and *Smlv* alone causes tiny leaves as in A. In addition, *Smlv* governs normal size of the seed and *smlv* the production of tiny seed. *Tlv* has no effect on seed size.

3282 Singh, D. & Shyam, R.
Sterility in gram.
Curr. Sci. 1958 : **27** : 491–92.

The sterility shown by some F_3 segregates of the "bunchy" mutant of *Cicer arietinum* was inherited as a simple recessive to the fertile condition of this mutant. The sterile mutant has apparently normal pistillate and staminate parts, although the anthers did not dehisce properly and produced less pollen than those of fertile mutant plants. Pollen grains and meiosis were normal in the sterile mutant. Embryological studies are to be carried out to determine the cause of the sterility, which appears to be due to some form of incompatibility.

3283 Richharia, R. H. & Ghosh, A. N.
Semi-trailing mutant in gram, *Cicer arietinum* L.
Proc. Bihar Acad. agric. Sci. 1955 : **4** : 113–15.

A description is given of the above mutant, found in the standard variety ST4 at Sabour, Bihar. Attempts to cross the mutant with the normal type failed, possibly on account of high temperature, since the crosses were attempted late in the season.

3284 Srivastava, R. N.
Varietal differences among polyploids obtained from different strains of gram (*Cicer arietinum* L.).
Proc. Bihar Acad. agric. Sci. 1955 : **4** : 59–66.

Germinating seeds of a black-seeded type, simple-leaved mutant, "tiny leaf" mutant, NP1, NP4, NP13 and NP26 were treated with 0·25% colchicine. Seed treatment for half an hour was more effective in inducing tetraploidy than treatment of the plumule just after it had emerged by wrapping it in absorbent cotton and dipping it in the solution three times daily for three days. Tetraploids were obtained from all the strains, except NP13. They possessed larger leaflets, flowers and other plant parts than the corresponding diploids, strain differences being observed between the tetraploids in the increases in size and reduction in fertility.

3285 Salokangas, K.
Sokerimaissin viljelymahdhollisuuksista Etelä-Suomessa. (**On the possibilities of sweet corn cultivation in Southern Finland**).
Maatalous ja Koetoiminta 1956 : **10** : 48–51.

Field trials have shown that a satisfactory crop can be obtained from certain of the earlier varieties of sweet corn in Southern Finland. The midseason variety Sugar Prince was outstanding in yield per plant and size of ear. Goldban gave the highest number of ears per plant. If pot-grown seedlings are transplanted, a larger number of smaller ears and a heavier crop are obtained from Sugar Prince.

3286 Thomas, W. I. & Eldredge, J. C.
Introduce new popcorn hybrid.
Iowa Fm. Sci. 1959 : **13** : No. 9 : p. 21.

The new yellow popcorn hybrid Iowa 4258 has tended to outyield Iopop 6 when grown south of Ames, Ia., whereas the two hybrids have been equal in yield north of Ames. Iowa 4258 has a popped flake equally free from hull as that of Iopop 6 but has a slightly higher popping volume and somewhat larger kernels than Iopop 6. The new hybrid has had fewer dropped ears than most other hybrids at a moisture content below 18% in the field. Iowa 4258 and Iopop 6 are similar in time taken after sowing to reach maturity.

3287 Rovesti, P.
Recherches sur les essences de quelques chemotypes de labiées aromatiques d'Erythrée. (**Investigations on the essential oils of some chemotypes of aromatic Labiatae in Eritrea**).
Pharm. Weekbl. 1957 : **92** : 843–45.
Intervarietal differences in constituent essential oils are reported for two varieties of *Micromeria abyssinica*, four of *M. biflora*, four of *Ocimum menthaefolium* and one new and one old variety of *O. canum*. The differences were related to differences in habitat and were stable under cultivation under other conditions.

ECONOMIC LOWER PLANTS

3288 Shimwell, J. L. & Carr, J. G.
Old and new cellulose-producing *Acetobacter* species.
J. Inst. Brew. 1958 : **64** : 477–84.
Study of many *Acetobacter* strains from vinegar, apple juice and cider has revealed the fairly common occurrence of strains which produce soft growths giving the cellulose reaction with iodine and sulphuric acid. An examination of other strains and mutants producing tough, thin to thick, *A. xylinum*-like pellicles showed that some did not always give a cellulose reaction. Both observations throw doubt on the validity of this test for cellulose. Recent claims by Steel and Walker [XXVIII, 1154 and 2404] that certain NCIB cultures of *A. xylinum*, *A. xylinoides* and *A. acetigenum* are motile and give rise to celluloseless, putrefactive, proteolytic, peptonizing, polar-flagellated and *Pseudomonas*-like mutants have not been confirmed. None of the typical *A. xylinum* cultures examined by the writers has shown motility. Only one case of the production of a celluloseless motile mutant has been encountered over a period of six years. This mutant represented a motile strain of *A. mesoxydans* and bore peritrichous flagella. Possibly *A. xylinum* is an artificially selected mutant of some commonly occurring "natural" species. Its production of pellicles containing cellulose, restricting the spread of the growth on solid media, may have a negative survival value under natural conditions.

3289 Ruokola, A.-L.
Torajyväsienen, *Claviceps purpurea* (Fr.) Tul.:n sklerotioiden itämisestä. [**On the germination of sclerotia of ergot, *C. purpurea* (Fr.) Tul.**].
Maataloust. Aikakausk. 1957 : **29** : 218–28.
A comparison is made of the germination of Finnish and German strains, particularly with respect to their response to low temperature treatment, which is more marked in the German strain, and to depth of planting. Finnish strains germinate somewhat better at 1 cm. depth, the German strain D_4 being superior at 50 cms.

3290 Chien, T.-R. [T.-J.] & Fang, H.-F.
Oriented adaptation of high yield strains of pentose-assimilating food yeast.
Sci. sin. 1959 : **8** : No. 1 : 61–82.
The three microorganisms used were respectively strains of *Candida tropicalis*, *C. utilis* and *Oidium lactis*. The optimum and maximum temperatures of growth were determined for each strain. One culture of each strain was kept at the optimum temperature as control while another was maintained at the maximum temperature in order to acclimatize it to high temperature. In another method the largest colony isolated on an hydrolysate-agar medium was cultured in a liquid medium of the hydrolysate at 40° C., isolation and culture of the largest colony at this temperature being repeated for many generations. Types adapted to high temperature were obtained by both methods. When cultured at the normal optimum temperature, they showed a greatly increased rate of metabolism, as indicated by enhanced rate of multiplication, dry weight, sugar and N assimilation and rate of oxygen consumption. The second method resulted in a higher degree of adaptation than the first. Both physiological and morphological changes arising during adaptation to high temperature may be heritable, the longer the period of adaptation the more stable being the new characteristics.

3291 Roman, H.
Sur les recombinaisons non réciproques chez "*Saccharomyces cerevisiae*" et sur les problèmes posés par ces phénomènes. (**Nonreciprocal recombinations in *S. cerevisiae* and the problems set by these phenomena**).
Ann. Génét. 1958 : **1** : No. 1 : G.11–G.17.
Much of the work mentioned here has been discussed elsewhere. It is thought that irregular segregation ratios for *Ad* alleles may be brought about by a mechanism similar to that responsible for reversions in heteroallelic combinations. [Cf. XXVII, 3647].

3292 Lindegren, C. C., Lindegren, G., Shult, E. E. & Desborough, S.
Chromosome maps of *Saccharomyces*.
Nature, Lond. 1959 : **183** : 800–03.
Maps are given for 20 loci in *S. cerevisiae*. From

the linkage data it is inferred that the haploid number is at least seven. The following findings are of particular interest. Chromosome I contains the linear sequence, *CA, CH, HI, IS, AN, CO*. In each of six families, which were heterozygous for *UR, TH, CH* (or *CA*) and any combinations of *HI, IS, AN* and *CO*, it was found that linkage group 1 "branched" into two arms respectively carrying *UR* and *TH*. The tetrad distributions of the three centromere markers (*CH, UR* and *TH*) with other randomly segregating centromere markers (*α* and *GA*) showed that the point of branching was identical with the centromere of chromosome I, about 5 units from the closely linked genes *CA* and *CH*. *CU* constituted another directly linked branch in two of the six families, but reverse linkage (74% recombination) of *CU* with *CH* and other members of the group to which *CH* belongs was detected in one family and established unequivocally that *CU* was situated on a chromosome distinct from that on which *CH* was located, and that in this case also the point of branching was identical with the centromere of chromosome I. These results demonstrate that the apparent branching of linkage groups results from preferential segregation of centromeres in parental combinations and that reverse linkage is the outcome of preferential segregation of centromeres in nonparental combinations. These findings therefore provide confirmation of the hypothesis that the site of affinity is the centromere [cf. XXVIII, 3658 and XXIV, 11].

3293 Itino, S. & Lindegren, C. C.
Polyploidy and the effect of anærobiosis on the production of respiratory deficient yeast.
Exp. Cell Res. 1958 : **15** : 628–30.

Several different yeast strains were grown in nutrient broth under anaerobic and aerobic conditions and counts were made of the respiratory deficient (aer) colonies. The proportion of aer cells in the total population was much higher in haploid cultures than in diploid cultures under aerobic and anaerobic conditions; the lowest proportions were found in the tetraploid cultures. In the haploid culture 8256, the rate of production of respiratory deficient cells from normal cells was found to increase under anaerobic conditions.

3294 Nagai, S. & Nagai, H.
The interactions between caffeine, guanosine and adenosine related to the induction of respiration-deficient yeast.
Naturwissenschaften 1958 : **45** : p. 577.

It was shown that caffeine induced respiratory deficiency in a diploid strain of baker's yeast. The cells were cultured in a medium which contained 2% glycerol instead of glucose. Treatment with 0·2% caffeine caused a significant increase of up to 23% in the frequency of respiration-deficient cells. Since the respiration-deficient cells could not multiply in this medium, the increase in their number was due to induction by caffeine. Solutions containing less than 0·1% caffeine were ineffective.

When guanosine and adenosine were added simultaneously with caffeine to cells growing in an ordinary medium, the effect of caffeine was markedly reduced. Neither guanosine nor adenosine when added separately were able to counteract the action of caffeine; also these two substances were not able to induce respiratory deficiency. It is suggested that a disturbance in nucleic-acid metabolism may be the common basis of both induced gene mutation and induced respiratory deficiency, which is usually of cytoplasmic origin.

3295 Rustad, R. C.
Identification of the nucleus of a fission yeast with fluorescent dyes.
Exp. Cell Res. 1958 : **15** : 441–46.

Staining with acridine orange produced a brilliant orange fluorescence in the cytoplasm and an intense green, yellow-green or yellow fluorescence in the central vacuole of *Schizosaccharomyces pombe*. Studies with animal tissues have previously shown that these colours are specific for RNA and DNA respectively. Therefore it has now been shown that the central vacuole of *S. pombe* contains DNA. A few other cells that are not satisfactorily stained by the standard Feulgen procedure also gave good results with acridine orange. It is thought that acridine orange may be the most sensitive cytochemical stain available for demonstrating DNA.

3296 Yuasa, A.
Karyological studies in *Saccharomyces*.
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1958 : **71** : 275–81.

Observations on haploid *S. cerevisiae* are reported. Three kinds of structures were identified in the vacuole: a nucleolus-like body and structures stained by toluidine blue and neutral red. The nucleus was attached to one side of the vacuole and at prophase contained two chromatin threads. Four chromosomes were observed at metaphase, the spindle being detectable in some cases. The author discusses his observations in relation to the findings of other investigators and to some of the technical difficulties involved in the cytological study of yeast.

3297 Sarachek, A.
The induction by ultraviolet radiation and the photoreactivation of heritable respiratory deficiency in *Saccharomyces* adapted and unadapted to aerobic respiration.
Cytologia, Tokyo 1958 : **23** : 143–58.

Respiration deficiency arising through ultraviolet irradiation was photoreversible only in the case of variants induced in cells adapted to aerobic respiration prior to irradiation. It was therefore concluded that the nucleus was the site of the ultraviolet damage and that the nuclear component affected was involved in the adaptive formation of respiratory enzymes. Inactivational injury caused by ultraviolet irradiation was however reparable by light treatment in both adapted and nonadapted cells with respect to aerobic respiration prior to irradiation. The expression of the ultraviolet damage resulting in the production of respiration-deficient variants was completely dependent on postirradiation conditions of respiration, whereas the expression of inactivational injury was only partly determined by these conditions. It is therefore considered that inactivation and the induction of respiratory variants were due to different nuclear disturbances.

3298 Ásváný, Á.
A kénessavtűrő magyar borélesztők összehasonlító vizsgálata. (**A comparative study of Hungarian wine yeasts resistant to sulphurous acid**).
Szőlészet. Kutató Int. Évkönyv. 1958 : **2** : 187–201. [from: Hungar. agric. Rev. 1958 : **7** : No. 4 : p. 7].

Among 14 strains of *Saccharomyces cerevisiae*, no relation between flocculence and resistance to SO_2 was detected. The new isolates Gyöngyös-a [Pearly a], Gyöngyös-b and Gyöngyös-c showed the highest resistance, being tolerant of 7·15 p.p.m. undissociated H_2SO_3 at pH 2·8 and able to ferment rapidly at 100 p.p.m. SO_2 at pH 3·45. Of the older strains, Nagyenyed 1 and Alsóhernád 2 were also tolerant of high SO_2 concentrations, while in other strains fermentation was inhibited by undissociated H_2SO_3 at 2·86 p.p.m.

BOOK REVIEWS

3299 Rüther, H.
Die Feldversuchstechnik. (**Field trial technique**).
Deutscher Bauernverlag 1958 : 2nd Ed. : DM 8.20 : Pp. 187 : 54 figs. : tables.

The first edition of this text book from the German Democratic Republic was published in 1952; it appears to have been popular, for in a relatively short time it was out of print. The second edition has been revised to take into account some recent findings of German investigators.

An opening chapter provides a brief account of the historical development and importance of field trials. The following sections of the book are concerned with the organization of field trials; the layout schemes of Mitscherlich and Lindhard, the long-plot method and new methods based on variance analysis, including block layouts, Latin square and rectangle, polyfactorial experiments and split plot designs, are described. There are also chapters providing instruction on the marking out of plots, seed sowing, care of the crops during growth, harvesting and assessing the yield and quality of the crop. The final chapter deals with the analysis of the experimental results, the recommended methods of analysis being illustrated by means of worked examples; the reader is not expected to have great mathematical knowledge. An appendix provides mathematical tables including tables of squares, square roots, t, p and F. A short glossary of technical terms and a short bibliography conclude the volume. The text is illustrated by adequate line drawings and photographs of varying value. Unfortunately this helpful little book is printed on paper of only moderate quality.

3300 Wagner, F.
Die technische Durchführung von Feldversuchen. (**The technique of conducting field trials**).
Paul Parey, Berlin & Hamburg 1959 : DM 19.80 : Pp. vii + 166 : 63 figs. : 38 tables.

This useful handbook deals fully with the practical side of field testing. The work is considered in the order in which it arises during the course of an experiment. In the first section on the planning of field trials, the layout schemes, including the Mitscherlich and Lindhard layouts, Zade's long-plot method, randomized blocks, Latin squares and rectangles and polyfactorial arrangements, are described and discussed. The following chapters are

concerned with preparation of the seed and the experimental area, laying out the plots, fertilizing the soil, sowing, planting, making observations on the performance of crops during the growth period and harvesting; special instructions are provided for testing the most important agricultural crops. The final chapter deals with the keeping of records. Being of a high standard of production, this book is pleasant to handle; the value of the text is enhanced by the illustrations, which include neat line drawings and photographs. A short bibliography and subject index complete the book.

3301 Pontecorvo, G.
Trends in genetic analysis.
Columbia University Press, New York; and Oxford University Press, London 1959 : Pp. x + 145 : 18 tables.

Based on the six Jesup Lectures delivered in April, 1956, at Columbia University, this book examines some of the new lines along which genetical thought is seen to be developing. Crossing over between alleles within a single locus (cistron) having been demonstrated, reference is made to cases where 360 or more sites have been identified within a cistron. The problem of defining the cistron which immediately arises is discussed in chapter 2, the conclusion being that insufficient evidence exists for supposing the bonds along the chromosome between cistrons to differ in kind from those between sites within the cistron. In chapter 3 we even read of the possibility that some cistrons overlap or are intermingled with others, and that one and the same site may "belong" to one cistron in respect of one activity and to another one in respect of a different activity. Genes having related functions may also be integrated into "higher fields" and several models designed to illustrate how this could function are discussed. That of Watson and Crick is considered good enough for the simplest systems such as the synthesis of an enzyme or other protein but is not expected to work for the vastly larger system of information demanded by a morphogenetic process.

In chapter 4 the extent of our ignorance of the mechanism of recombination is emphasized. Detailed studies by recently developed techniques suggest that exchanges tend to occur in clusters; all models of a template-copying mechanism so far proposed are considered unsatisfactory and it is suggested that the chromosomal elementary fibril may be double, i.e. made up of two identical templates. No grounds are found for assuming that the mechanism of recombination as observed in phage, or as resulting from transformation and transduction, is basically different from that in meiosis.

In chapter 5 an impressive body of data on mitotic crossing over is assembled [cf. XXVIII, 3561] and its use in chromosome mapping is described. Novel genetic systems form the subject of the last chapter. These include transformation, bacteriophage-mediated transduction and lysogenization in bacteria and the parasexual cycle in fungi, all of which ensure genetic recombination without sexual reproduction, and usually in a more versatile form. This is illustrated by a full description of the parasexual cycle in *Aspergillus nidulans*, largely on the basis of the author's personal observations [cf. XXVII, p. 158], and in several other filamentous fungi. Fusion of unlike nuclei in a heterocaryon, followed by occasional mitotic crossing over and haploidization, are thought to provide ample opportunity for segregation and recombination. It is envisaged that with the study of mitotic segregation in cell cultures the knowledge of the genetics of man and of other slow-breeding organisms may soon become more extensive than that of *Drosophila*.

Anyone who still naively believes that geneticists conceive of genes as beads on a string would do well to read this book.

3302 Heberer, G. (Editor).
Dokumente zur Begründung der Abstammungslehre vor 100 Jahren, 1858/59–1958/59. (**Documents for the founding of the theory of evolution 100 years ago, 1858-59 - 1958-59**).
Gustav Fischer Verlag, Stuttgart 1959 : DM 7.80 : Pp. 71 : 4 plates.

To celebrate the one hundredth anniversary of the presentation of the papers of Darwin and Wallace to the Linnaean Society in London in 1858 and the publication of *The origin of species* in 1859, this small volume is published under the editorship of G. Heberer, who provides an historical introduction describing the events that led to Darwin's formulation of his theory; in this he lays particular emphasis on the remarkable coincidence of views arrived at by two students working independently in the same field. There follow German translations of Darwin's sketches of 1837–38 and 1844, letters of Lyell and Hooker to the Secretary of the Linnaean Society, the letter of 1857 from Darwin to Asa Gray, Darwin's extract of 1858, Wallace's essay of 1858 and article of 1855, Darwin's introduction to *The origin of species*,

together with the chapter headings, and finally Wallace's notes on Malthus.

3303 Clausen, J. & Hiesey, W. M.
Experimental studies on the nature of species. IV. Genetic structure of ecological races.
Carnegie Institution of Washington Publication 615, Washington, D.C. : 1958 : $4.25 : Pp. 312 : 33 figs. : 68 tables.

As the authors point out in the preface, ecological genetics is a new integrating field in biology. Three methods of investigation are applicable. One is Mendelian analysis of genes controlling the inheritance of individual characters distinguishing ecological races, another and as yet relatively unexplored approach is the study of the expression of the genes in different environments, while the third, whose development also lies in the future, is the determination of the physiological pathways by means of which the genes achieve their observable end-effects in diverse environments. The ecological races of *Potentilla glandulosa*, a long-lived perennial, are particularly well suited to such investigations. The species is widespread over the western half of North America, its numerous races occurring in an extremely wide range of climates and possessing characters suitable as morphological markers in genetic analysis. The races are all diploid ($2n = 14$) and even the most diverse intercross. Chapter I deals with the ecological variation shown by populations of four subspecies along an altitudinal 200-mile transect at a latitude of about 38° in central California. Seeds collected along the transect were raised in experimental gardens under uniform conditions at three contrasting altitudes. Four degrees in ecological differentiation were recognizable: (1) biotypes within the same local population, (2) random but overlapping variability between isolated local populations from one general climatic region and similar edaphic conditions, (3) ecotypes and (4) differentiation into ecotypically distinct subspecies, each of which was represented by at least two ecotypes. Intraspecific variation appeared to be both continuous and discontinuous, since a cline occurred for one character (time of flowering) within one subspecies whereas other subspecies appeared to vary randomly in this respect. In chapter II, a report is given of the results of a genetic analysis of ecological races with respect to distinguishing features such as size and colour of flower and plant parts, frost susceptibility and earliness of flowering. Most of the characters depended on small systems of multiple genes. Chapter III deals with the phenotypic expression of genes conditioning qualitative and quantitative characters, as influenced by environmental conditions at the three contrasting altitudes. Chapter IV consists of a comprehensive review of the chief contributions to literature throwing light on the genetic systems controlling (1) individual characters of various types in many organisms, (2) biochemical and physiological properties and their expression in different environments, (3) ecological races and (4) differentiation into subspecies and other taxonomic entities. The review includes relevant studies on animal genetics. In the final chapter, the authors summarize some basic concepts they have arrived at concerning the genetics of ecotypes, subspecies and closely related species. Differentiation, they conclude, depends upon systems of multiple genes with additive, epistatic, oppositional or complementary interactions in various degrees. The phenotypic expression of nearly all genes is influenced to some extent by the environment. Above or below certain environmental thresholds the effects of some genes may not be apparent. Activation of such latent genes may lead to striking morphological effects when forms possessing them are grown outside the normal range. Only relatively superficial aspects of the over-all genetic structure of plants have as yet been investigated, since every analysis is necessarily limited to differences and thus part of the genotype eludes analysis. Hybridization between ecological races offers a possibility of penetrating more deeply in genetical analysis since it may lead to the detection of undiscovered groups of characters as the result of interaction among the four basic types of genetic systems. Under natural conditions, hybridization must also play a role in the continuous dynamic process of adjustment of ecotypes through environmental selection among variable biotypes. In diploids, such as *P. glandulosa*, the presence of small systems of multiple genes leads to a moderate amount of linkage so that coherence is found in parental combinations of characters but with possibility of recombination. The ways in which a balanced interaction among genes, the physiological processes they control and an ever-changing environment is attained by natural populations are largely unknown, homeostasis being rejected as an inadequate basis of interpretation. In crosses between ecotypes, the expression of hybrid vigour, dependent on genes evenly distributed among the chromosomes and not closely linked, as is believed to be the case in *P. glandulosa* and

Achillea millefolium, is related to transgressive segregation and is brought about by recombination affecting the four basic systems. Finally, the evolutionary significance of ecological races as separate reservoirs of genes receives consideration. The authors make a notable contribution to the highly complex analysis of ecological variation, which should promote the establishment of sound working principles in this developing province of enquiry.

3304 Brachet, J. & Mirsky, A. E. (Editors). **The cell: biochemistry, physiology, morphology. Vol. 1.**
Academic Press, New York and London 1959 : $22.00 : Pp. xxi + 816 : figs. : tables.

Cells are today the subject of study by workers in every field of biology and medicine. A text book on the cell therefore requires not one volume, but three substantial ones, and not one author, as was the case in the first half of the century, but a series. The first volume of this composite work deals, in part 1, with methods and, in part 2, with problems of cell biology. The first contribution is devoted to optical methods, which include the use of the electron and X-ray microscope as well as the optical; there are others on autoradiography, quantitative microscopical and microchemical techniques, micrurgical studies on living cells, isolation of subcellular components and the cell as an organism.

Part 2 begins with a contribution on Fertilization, by J. Runnström, B. E. Hagström and P. Perlmann, with special sections on fertilization in bacteria, green algae, infusoria and metazoa. Support is given to the view that the significance of fertilization is in restoring the "active and intimate interchange between nucleus and cytoplasm".

L. Gallen, under the title Sex determination, surveys first the chromosomal and then the genetic aspects of sex determination in the lower animals. The next contribution is on Differentiation of vertebrate cells, by C. Grobstein, and is followed by Patterns of cell growth and differentiation in plants, by R. O. Erickson. Shoot development from a single apical cell is described in the Charophyta, *Equisetum*, ferns and allied groups; apical development from a group of initial cells, as in the angiosperms, is treated next; some of the more controversial issues such as the activity or passivity of the cells of the apex of the meristem will, it is thought, only be solved by making observations on growing apices in sufficient detail over a sufficient length of time. The gymnosperm shoot is next examined, to be followed by roots of angiosperms and gymnosperms.

Nucleocytoplasmic interactions in eggs and embryos, by R. Briggs and T. J. King, is followed by The acquisition of biological specificity, by J. D. Ebert, and the volume is completed by Effects of radiations on cells, by M. Errera. An outline is given of the physical, chemical and biochemical effects produced by ionizing radiations, by ultraviolet rays and by visible light. Under the cytochemical effects, those on nucleus and cytoplasm are treated separately; the effects on mitosis and the induction of mutations appear, however, under biological effects. This last contribution is extremely general and seems to have escaped the hand of the editor responsible for grammatical construction.

3305 McElroy, W. D. & Glass, B. (Editors). **A symposium on the chemical basis of development.**
The Johns Hopkins Press, Baltimore; and Oxford University Press, London 1958 : £6 : Pp. xi + 934 : figs. : tables.

The 1956 symposium of the McCollum-Pratt Institute of the Johns Hopkins University having been devoted to the chemical basis of heredity [XXVIII, 1074], the 1958 symposium was dedicated to the chemical basis of development. As in the preceding volume, the discussions are reported as well as the texts of the contributions. C. L. Markert, in Chemical concepts of cellular differentiation, outlines the main problems of developmental cytology, which forms the subject of part 1 of the symposium; in spite of the quantity of information on the consequences in development of changing the initial activity of a gene, yet "the primary or even derived chemical consequences of gene function" still escape detection. The most that is thought justifiable is reference to some evidence that the nucleus and the chromosomes differentiate during development.

The next two communications are devoted to the initiation of development and to morphogenesis in the so-called mosaic egg of *Tubifex* and are followed by Chromosomal differentiation, by J. G. Gall, who describes firstly the structure of the giant dipteran chromosomes; evidence is given for regarding them as being formed by repeated chromosome duplication without separation, and the Balbiani ring region as the site of synthesis of RNA. Lampbrush chromosomes are interpreted as long, continuous chromosome strands, not much more

than 100 Å in diameter, the loops being temporary sites of RNA synthesis.

W. L. Hughes writes on Chromosomal replication and the dynamics of cellular proliferation—some autoradiographic observations with tritiated thymidine; roots of *Vicia faba* after growth in the radioactive solutions for 8 hr. were transferred to colchicine to cause the sister chromatids to spread apart without anaphase separation. In cells with 12 metaphase chromosomes, which had thus duplicated once only, the two sister chromatids were equally labelled; in those with 24, all chromosomes were labelled but in one chromatid only; cells with 48 had one labelled: one unlabelled, the former being labelled also in one chromatid only. The results are taken to indicate "(1) that the thymidine built into the DNA of a chromosome is part of a physical entity that remains intact during succeeding replications and nuclear divisions, except for an occasional chromatid exchange; (2) that a chromosome is composed of two such entities probably complementary to each other; and (3) that after replication of each to form a chromosome with four entities, the chromosome divides so that each chromatid (daughter chromosome) regularly receives an 'original' and a 'new' unit." The pattern is analogous to the replicating scheme proposed by Watson and Crick. A similar mechanism is also indicated by experiments on *Escherichia coli*. In bean roots labelled cytidine, a precursor of RNA, was incorporated first into the nucleoli and then migrated to the cytoplasm.

Contributions on origin and structure of intercellular matrix and cytoplasmic particles and basophilia complete part 1.

Part 2 is devoted to cellular and tissue interactions in development and contains several communications on the influence of mutant strains on the aggregation of slime moulds to form a pseudoplasmodium. Part 3 is devoted to problems of specificity in growth and development and part 4 to control mechanisms of development. All these parts are concerned mainly with zoological material but M. Cohn writes On the differentiation of a population of *Escherichia coli* with respect to β-galactosidase formation. Preinduced capacity to synthesize β-galactosidase has been maintained in a culture for over 150 generations and is considered in some ways analogous to differentiation in the cells of higher organisms. It is also pointed out that in this way two clones, one with and one without the synthetic capacity, can be produced without any mutation or other genetic change having occurred. The same point is made by H. J. Vogel in Comment on the possible roles of repressers and inducers of enzyme formation in development, where the possibility is also envisaged that the small molecules that effect enzyme induction or repression may have affinity for the respective portions of the genome and thus produce true genetic changes too. The role of genes in developmental processes was discussed by E. Hadorn, who examined the times at which various genes exert their action, mentioning some that are effective almost immediately after fertilization, even before the formation of the zygotic nucleus. It is shown from the rosy mutant in *Drosophila* that a gene-conditioned product may be present long before any concrete effect of the gene can be detected; an enzyme has been identified as the locus-specific product and is formed only in certain cellular systems; a distinction is made between those characters (phenes) which behave autonomously in transplants, referred to as autophenes, and those that are "determined by the genic specificity of extrinsic links", referred to as allophenes.

In his summation and evaluation, P. Weiss pointed to the gratifying convergence of the fields of botany, microbiology, genetics, pathology and embryology on the common foci of interest in the problems of development, while emphasizing the fact that we are "at the beginning, and not near the end, of the process of understanding development". Points considered as having been inadequately discussed in the symposium are the population aspect of cell biology, processes of dichotomy in cell development, protoplasmic movement and surface specificity.

The volume is completed by an extensive summary by B. Glass, who once more contrasts the great advances in knowledge of the fine structure of the cell and its parts with the extent of ignorance that still reigns concerning function.

3306 RUHLAND, W.
Handbuch der Pflanzenphysiologie. (**Encyclopedia of plant physiology**). Springer-Verlag, Berlin 1959 : DM 216.00 : Pp. xiv + 716 : figs. : tables.

The seventeenth volume of this monumental series [cf. 2118] is devoted to the physiology of movements in plants. It starts with historical and general introductions by E. Bünning, who also contributes a number of the other sections. There is a series of essays on the processes that stimulate motion in different species of sensitive plants, the action of wounding, electric and other physical stimuli, the movements of chloroplasts, the phototaxis of algae and purple

bacteria, protoplasmic streaming, the movements of stomata, phototropism in higher and lower plants, and finally, diurnal movements.

The volume follows the practice adopted in earlier numbers of the series in respect of bibliographies and author and subject indexes.

3307 Luck, J. M., Allen, F. W. & Mackinney, G. (Editors).
Annual review of biochemistry. Volume 27.
Annual Reviews, Inc., Palo Alto, California 1958 : $7.50 : Pp. vii + 775 : figs. : tables.

Compared with previous numbers [cf. XXVIII, 1078], this year's volume contains rather less that is of direct interest to the plant geneticist. H. Chantrenne, in his review of New developments in relation to protein biosynthesis, discusses the genetic control of protein synthesis. He reports several instances of gene mutation resulting in a slight change in the protein produced and not in complete inhibition of the synthesis of a type of protein. He also cites work on sickle-cell hemoglobin showing that a simple mutation can cause the replacement of one aminoacid by another in a specific protein. Estimations by various authors indicate that it is not impossible that the arrangement of all the aminoacids of a protein is controlled by the arrangement of the nucleotides in the DNA of the corresponding gene. Studies of enucleate cytoplasm show that protein synthesis occurs in the absence of nuclear genetic material and the study of isolated animal nuclei and bacterial systems has not provided evidence for the direct participation of DNA in protein synthesis. The possibility that RNA may play a part in the transference of genetic information from DNA to the protein-synthesizing systems is discussed and work on the role of RNA in protein synthesis is reviewed.

Synthesis of DNA is briefly touched upon by L. A. Heppel and J. C. Rabinowitz in Enzymology of nucleic acids, purines and pyrimidines.

Other topics reviewed include carbohydrate chemistry, viruses, cancer, antibiotics, carbohydrate metabolism, biological oxidations, proteolytic enzymes, aminoacid metabolism, metabolic antagonists and biochemistry in the USSR.

3308 Foster, A. S. & Gifford, E. M. (Jun.)
Comparative morphology of vascular plants.
W. H. Freeman and Company, San Francisco, California; and Bailey Bros. & Swinfen Ltd., London 1959 : 76s. 6d. : Pp. xi + 555 : 213 figs.

With the exception of volume I of R. C. McLean's and W. R. Ivimey-Cook's massive Textbook of theoretical botany, no current text book suitable for use in the general degree course covers in a single volume the morphology of all the main groups of vascular plants. For this reason alone this new text book would be welcome, but it also has other merits. It does not merely repeat and rearrange matter from older text books but has an emphasis and approach of its own. For example, as might be expected of the authors, appreciably more attention is paid to ontogenetical and embryological studies and their value in the study of plant relationships than in most text books of morphology. Unfortunately there is a corresponding lack of detail in the treatment of fossil members of the various groups.

A problem which every teacher and every writer of text books has to settle in advance is that of presentation: whether to build up the picture bit by bit or to begin with a general outline and subsequently fill in the gaps. The former method is perhaps the more logical but has the disadvantage, as the present authors say, that the student is liable to find himself in the situation of being unable to see the wood for the trees. The second method, adopted in the volume under review, in effect provides the student with a generalized map of the area he is to cover and thus has obvious advantages. The difficulty is to decide what is to be depicted on the map. In this book, the first six chapters are those which outline the subject and are intended to orientate the student. The first discusses the type of evidence upon which morphological interpretations are based, the second outlines the salient features of the life cycle and classification of vascular plants, the third describes the vegetative sporophyte and the fourth, fifth and sixth deal respectively with sporangia, gametangia and embryogeny. In these last three chapters, the drawback of this method of presentation is particularly clear, for in order to describe the different types of development of the various organs, frequent reference to named examples has to be made and the student is thus presented with a barrage of names of plants of whose individual characteristics or relationships he has been told little or nothing as yet. However, these chapters form useful summaries to which reference may be made once the groundwork has been acquired in the later chapters dealing with the individual groups. This is facilitated by the numerous cross references in the text.

The book contains numerous illustrations, many of them familiar from older text books but

some of them drawn from recent sources and some, chiefly photographs, entirely new. Most are good, but some, for example those of the Calamitales on page 215, could be improved upon.

Each chapter concludes with a list of references and the volume is completed by a detailed index.

3309 Clapham, A. R., Tutin, T. G. & Warburg, E. F.
Excursion flora of the British Isles.
Cambridge University Press 1959 : 22s. 6d. : Pp. xxxiii + 579 : 3 figs.

The general adoption by British botanists of the new Flora of the British Isles by the above authors, anticipated in our review of this flora [XX, p. 467], has led to a demand for a more portable version of the flora for outdoor use. The present volume, though beyond the capacity of the average hip pocket, should meet this need effectively since it presents the quintessence of the larger work in just over a third of its volume.

Space has been saved by shortening descriptions, excluding information on "biology" and chromosome numbers, omitting descriptions of critical and rarer species and cutting out text figures. However, all species are included in the keys.

Some newly discovered species such as *Diapensia lapponica*, unknown in the British Isles when the larger flora was published, are now included in the keys, and various taxonomic and nomenclatural changes, which will be made in the next edition of the larger flora, are anticipated here. The new flora will doubtless become a familiar adjunct of field excursions throughout the British Isles.

3310 Pitschmann, H. & Reisigl, H.
Bilderflora der Südalpen vom Gardasee zum Comersee. (**Illustrated flora of the southern Alps from Lake Garda to Lake Como**).
Gustav Fischer Verlag, Stuttgart 1959 : DM 28.50 : Pp. 278 : 11 figs. : 64 plates.

The region between Lake Como and Lake Garda must be floristically one of the loveliest in Europe, for it forms a meeting place for two rich and widely different floras, the Mediterranean and the Alpine. From the shores of Lake Garda, with its olive groves and cypresses, it is possible to walk in a single day's excursion through holm-oak woods with their accompanying Mediterranean vegetation up to the higher mixed woods and spruce forest and finally up to the truly Alpine grasslands and heaths.

The enthusiasm of Dr. Pitschmann and Dr. Reisigl for the area and their intention of writing this book date from 1949 when they paid their first postwar visit to the southern Alps. They were immediately delighted with the richness and beauty of the vegetation but were hampered, on this and subsequent visits, by the lack of a suitable flora. Carl Schröter's popular illustrated Flora des Südens [Flora of the South] had been out of print for many years and they therefore resolved to write a flora along similar lines themselves. The result is this very handy but comprehensive and copiously illustrated volume. In a book of this size it would clearly have been impossible to include descriptions of every species growing in the region, and the authors have therefore confined themselves largely to those which are most characteristic of the area, including introduced plants; but conspicuous species with a wider distribution also receive attention, since the book is intended for the amateur as well as for the student or professional botanist. For the same reasons, some of the larger genera, such as *Carex*, *Euphrasia* and many grasses, have been dealt with only briefly. The text is written as a series of dichotomous keys arranged according to family and for each species notes on habit, time of flowering, habitat and area of distribution are given. In the interests of economy, keys to the families and notes on family characters have been omitted entirely. This is surely a mistake, since even among the trained botanists who are expected to use this flora there must be many who cannot immediately place a specimen in its correct family. However, the fact that at least one member from nearly every family is illustrated makes this slightly less of a defect than it might otherwise have proved.

There are coloured illustrations of 178 species and line drawings of 219, occupying 64 pages in all. These, executed by Dr. H. Schiechtl, are very well done and the coloured drawings are particularly attractive. Many of them unfortunately suffer from the reduction in size necessitated by reproduction, so that often little more than the general appearance of the plant can be ascertained from the drawing. Another failing is the lack of any indication of scale.

A useful feature of the book is the introduction, which includes information on the geology, landscape and climate of the area, on the history of the flora and on the different plant communities to be found there, together with recommendations for botanical excursions.

All in all, this is a book which anyone who wishes to botanize in the southern Alps, and who has some knowledge of German, will be

glad to possess. Not the least of its merits is that it arouses a strong wish to visit the region in the reader who has never been there.

3311 Hitchcock, C. L., Cronquist, A., Ownbey, M. & Thompson, J. W.
Vascular plants of the Pacific Northwest. Part 4: Ericaceae through Campanulaceae.
University of Washington Press, Seattle 1959 : $12.00 : Pp. 510 : figs.

The excellent and unusual characteristics of this flora, in particular its treatment of intraspecific variation and interspecific relationships, were noted in our review of the first volume to be issued [cf. XXVI, p. 529]. These features reappear in the present volume which deals in Englerian order with the Sympetalous families Ericaceae to Campanulaceae.

The authorship of the present volume is as follows. C. L. Hitchcock deals with the Ericaceae to Cuscutaceae, M. Ownbey with the difficult genus *Castilleja* of the Scrophulariaceae and A. Cronquist with the remainder. An additional feature of the present volume is provided by brief horticultural notes on relevant species compiled in collaboration with B. O. Mulligan and C. S. English. Each species is figured. The drawings are by J. R. Janish and, while a little more sketchy than in the earlier volume, greatly enhance the value of the book. An enlightened reaction against excessive splitting pervades the entire volume. We even find the Pyrolaceae, Monotropaceae and Vacciniaceae back in the Ericaceae and *Oxycoccus* back in *Vaccinium*. Throughout, this flora is one that a geneticist can handle without fear of allergic reaction.

Not many economic as contrasted with ornamental species come into the present volume. *Vaccinium*, however, is represented by 14 species, and the section on *Penstemon*, which has provided useful data on speciation problems, was written in consultation with D. D. Keck whose studies on experimental taxonomy will be familiar to readers of *Plant Breeding Abstracts*.

3312 Hill, C. C.
Spring flowers of the lower Columbia valley.
University of Washington Press, Seattle 1958 : $3.00 : Pp. xi + 164 : illus.

Clara Chapman Hill's descriptive notes on some 200 spring flowering herbs and shrubs and Mary Comber Miles's 71 full-page illustrations together form an attractive book. The notes are mostly simple botanical descriptions with information on habitat and distribution but sometimes pieces of general information on edibility and other properties are included, mention being made, for example, of the Indians' use of a decoction of the roots of roses as a shampoo. The drawings are beautifully done and uniformly good. Those for whom local plant names have any appeal will find further attractions in the book. There is a long list of such pretty but fairly commonplace names as thimbleberry, salmonberry, ocean spray and fringe cup, a number of Indian food plants with definitely outlandish names like camas and salal and finally a wild cucumber with the curious name of old-man-in-the-ground.

Since the book is intended for "nature lovers, hikers, Boy Scouts, Girl Scouts, Campfire Girls and students in general" rather than botanists, the number of technical terms has been kept very low and the few which are used are explained and illustrated in the introduction; there is also a glossary. It is a pity that more care has not been taken over details of the book, however. The drawings illustrating the botanical terms are rather carelessly presented and those on pages x and xi are neither mentioned in the text nor adequately labelled. Some of the full-page illustrations include enlargements of individual plant parts, but these are not labelled and it is not always easy to determine just which organ has been selected for enlargement. Another awkwardness which could have been avoided is the lack of any page references in the key to the genera, so that, having traced his specimen to its genus, the reader has to turn to the index before he can find descriptions and illustrations of the species.

Nevertheless, with its excellent drawings and short clear descriptions, this little book will certainly be useful to those whose chief interest is in the names rather than the botany of the plants they see.

3313 Grant, V.
Natural history of the phlox family. Vol. 1. Systematic botany.
Martinus Nijhoff, The Hague 1959 : f. 19 : Pp. xv + 280 : 79 figs. : 14 tables : 1 plate.

The author's aim in this taxonomic study has been to treat the Polemoniaceae as a model of evolution in a group of higher plants; the family has been considered from the point of view of a naturalist rather than that of a theoretical evolutionist.

The work begins with a survey of the botanical history of the family and its systematic relationships; this is followed by a general account of the morphology of the family. A full taxonomic

review is then provided; attempts have been made to redefine and circumscribe tribes, genera and sections of genera in the light of present knowledge. A chapter dealing with nomenclature includes tables of synonyms, an alphabetical list of generic and infrageneric names and a list of binomials. All known chromosome numbers for the family are listed, 148 new counts being recorded. Caryotype evolution is also discussed. Other chapters deal with phylogeny and phytogeography.

In this book there is much to interest the taxonomist and others concerned with the evolution of higher plants. Promising lines of investigation for future study are suggested with a view to stimulating others to comparative work in this family. The book is well supplied with illustrations which include line drawings, diagrams and maps. A full bibliography classified according to subject and an index conclude the volume. Reproductive biology is to be dealt with in a second volume.

3314 Steinhaus, E. A. (Editor).
Annual review of entomology. Vol. 4.
Annual Reviews, Inc., Palo Alto, California 1959 : $7.50 : Pp. vii + 467 : figs. : tables.

With the issue of the fourth volume this useful series [cf. 2115] is regarded as established and will receive no further contributions from the Entomological Society of America.

Insect taxonomy has suffered seriously in the past by insufficient attention to genetic and evolutionary principles. Readers will therefore welcome the contribution on Taxonomic problems with closely related species, by W. J. Brown, in which various concepts of the species other than the purely typological one are examined. Reproductive isolation, though important, is not an absolute criterion. Much of the difficulty of definition resulting from intergrading has now, it seems, been transferred from the species to the subspecies, parthenogenetic forms presenting a special problem. It is conceded that even the best taxonomic arrangements are greatly oversimplified. Various methods adopted in separating closely related forms are illustrated by several insect genera in which morphological uniformity masks a high degree of specificity as regards host species or other physiological characteristics.

In the review on Experimental host-parasite populations, T. Burnett examines some of the factors that affect host-parasite interaction. One of these is the set of conditions under which the parasite operates in nature, to which it becomes adapted by selection, and it is pointed out that parasites reared in the laboratory may consequently be unsuitable in certain circumstances in the field. In fact, it seems that most studies so far have failed to take into account the full complexity of the systems and the conclusion of the survey is that "until many more data are available empirical investigations will probably deal not with details but with the general trend of host and parasite growth forms".

Workers concerned with virus diseases of plants will find much to interest them in the contribution on Biology of aphids by J. S. Kennedy and H. L. Stroyan. The polyphagy of such familiar aphids as *Myzus persicae* and *Aphis fabae* is, we find, not typical. Nevertheless, the persistence and evolution of this type of aphid may be encouraged by plant breeding and agricultural practice, since "the repeated growing of susceptible plants removes previous restraints on evolutionary tendencies to simultaneous polyphagy, to host changing, and to unrestrained host exploitation, and our knowledge of aphid biology is not yet adequate to check them".

Other topics reviewed in this issue include Culture of insect tissues, Pheromones (ectohormones) in insects and Bioclimatic studies with insects.

3315 Smith, K. M. & Lauffer, M. A. (Editors).
Advances in virus research. Volume VI.
Academic Books Ltd., London 1959 : $10.00 : Pp. viii + 382 : figs. : tables.

We start this year [cf. XXVIII, 3572] with a long review on The purification of plant viruses, by R. L. Steere. Next comes Biochemistry of plant virus infection, by C. A. Porter; the various anomalous proteins that occur after virus infection are regarded as intermediates in virus synthesis. Other changes observed in infected plants are reduction of nonprotein nitrogen, leading to the conclusion that the virus derives its N largely from free ammonia. Experiments are referred to which indicate that nucleic acid is the main genetic determinant in the virus and can bring about infection even in the absence of the protein portion. The importance of the host in guiding the synthetic process of virus synthesis is demonstrated by the finding, by Bawden, that a strain of TMV shows reversible changes in biological and certain

biochemical properties when produced in different plants.

L. Broadbent and C. Martini write on The spread of plant viruses and S. Brenner on Physiological aspects of bacteriophage genetics. The reviewers refer to the r_{II} mutants described by Benzer [XXVIII, 1074]; within each r_{II} cistron numerous mutations may occur which are unable to complement one another and each cistron is supposed to control the details of the structure of a polypeptide chain which performs a vital function. Another genetic region has been distinguished which controls the structure of a site, probably in the phage tail, involved in the adsorption of the phage to the host bacterium, and this has been correlated closely with serological specificity. However, recent work by Fraser suggests that host-range variants in some cases are not produced by mutation but by a recombination between the genetic material of the phage and that of the bacterial host. Another genetic region controls the ability to lysogenize sensitive bacteria and various other defective mutants are referred to, some of them defective at early stages of phage growth, others only at a relatively late stage, the two groups involving different regions of the genetic map. From studies on these lines it should be possible to throw light on the relation between the nucleotide sequence of the DNA of a cistron and the aminoacid sequence of the protein that it specifies.

The next two contributions deal respectively with Purification and properties of poliovirus and with measles virus and the volume is completed by an exhaustive survey by T. M. Sonneborn on Kappa and related particles in Paramecium, covering over 125 pages, in which the author takes "a fresh, critical look at the whole corpus of knowledge about the particles themselves". The toxic agent is now known to be a single particle and not a substance, the term paramecin having therefore been reserved for an hypothetical substance within the particle rather than the toxic agent itself. The particles have no killing capacity while they are in the body of the killer and develop it only after release, for which development DNA seems to be necessary. Most, if not all, of the mutations observed involve loss of properties and are apparently not reversible. Various points of similarity between this system and the colicins and phages are examined. The mode of reproduction of the particles is described. The fission rate is not affected by any known genes of the paramecia and all changes in behaviour have proved to be due to mutations in the particles themselves; they include a number of induced mutants resistant to aureomycin. The majority of the mutations involve more than one character.

Evidence is cited to show that particles similar to the kappa particles occur in many organisms. The difficulties of distinguishing between endogenous particles, such as chloroplasts, and exogenous inclusions such as an alga, bacterium or virus are expounded. The kappa particles share with viruses an even distribution of DNA throughout the particle and the absence of enzymes, yet they differ in their transverse fission and sensitivity to many antibiotics. The possibility that kappa particles constitute an intermediate between virus and bacterium is not therefore excluded; nor is the possibility that kappa is a mitochondrion infected with an alien particle rich in DNA. Some lines of investigation that might throw further light on the problem are suggested.

3316 MÜLLER, P. (Editor).
DDT. The insecticide dichlorodiphenyltrichloroethane and its significance. Vol. II.
Birkhäuser Verlag Basel und Stuttgart 1959 : sFr. 66.00 : Pp. 570 : figs. : tables.

The second volume of this useful work, promised for 1956 [cf. XXV, p. 635], has now appeared. DDT is still, we are told, the most commonly used insecticide, though an increasing number of insects have become resistant to it. The whole problem of this resistance is dealt with in a special section of the chapter, by S. W. Simmons, on The use of DDT insecticides in human medicine and will undoubtedly be of interest to plant breeders, who are confronted with many parallel problems in breeding plants resistant to diseases and pests. A long list of insects that have developed resistance is presented, comprising reports from 33 countries, relating to 32 different species. In some cases the resistance was already present in the population and did not arise in response to the treatment. Some physiological differences between susceptible and resistant insects are reported but the exact nature of resistance remains largely a matter of speculation and its inheritance seems to be highly complex. Upon occasion resistance to DDT is combined with resistance to certain other insecticides, particularly those that are closely related chemically. Some suggestions are made for reducing the probability of resistance arising in practice.

The volume ends with a bibliography of 203 titles.

3317 Roemer, T. & Rudorf, W. (Editors). Handbuch der Pflanzenzüchtung. **(Manual of plant breeding).** Paul Parey, Berlin & Hamburg 1956 : 2nd. Ed. : Lief. 26 : Vo. 4 : Bogen 11–15 : 161–240; Lief. 27 : Vo. 2 : Bogen 36–38 : 561–607 + xxiii; Lief. 28 : Vo. 4 : Bogen 16–20 : 241–320; Lief. 29 : Vo. 5 : Bogen 1–5 : 1–80 : figs. : tables : DM 13.50 each.

Instalment 26 [cf. 2116] continues the section on lucerne species in volume 4, dealing with the inheritance of characters of agricultural value, most of which are treated by W. M. Myers. The first character is winter hardiness, which is considered under three headings, cold tolerance, crown development and root development. Next come drought resistance, adaptation to acid soils, salt tolerance, adaptation to fertility levels, symbiotic relations, hard seeds, flowering habit, chemical composition (carotene content, protein content, quality of protein) and finally attractiveness to bees. Inheritance of disease resistance is reviewed under the headings bacterial wilt, common leaf-spot (*Pseudopeziza medicaginis*), black stem (*Phoma herbarum* var. *medicaginis*), rust (*Uromyces striatus* var. *medicaginis*), yellow leaf blotch (*Pseudopeziza jonesii*), downy mildew (*Peronospora trifoliorum*), leaf spot and root rot (*Stagonospora meliloti*), stem rot (*Sclerotinia trifoliorum*), *Colletotrichum trifolii*, root and crown rot (*Fusarium* spp. *et al.*), stem nematode (*Ditylenchus dipsaci*) and root knot nematode (*Meloidogyne* spp.). Inheritance of insect resistance is treated separately, the insects considered being potato leaf-hopper (*Empoasca fabae*), pea aphid (*Macrosiphum pisi*), spotted aphid (*Therioaphis maculata*), meadow spittle bug (*Philaenus leucophthalmus*) and *Lygus* spp. Next to be considered are the effects of inbreeding, heterosis and combining ability and methods of breeding in the western hemisphere; in this last section considerable attention is given to the development of synthetics. The instalment continues with Steinklee [Sweet clover], by W. Rudorf, who deals with cytology and crossing ability, biology of flowering and fertilization, mutation, genetics of certain characters, polyploidy and the problems and results of breeding; these include the production of lines low in content of coumarin and allied compounds, resulting from the application of methods for the rapid estimation of these substances by means of fluorescence; other achievements are the breeding of lines resistant to *Ascochyta* spp., mosaic virus and frost. This instalment contains the first part of Trifolium-Arten [*Trifolium* species] by G. Julén.

Instalment 27 completes the section on *Panicum* and *Setaria* in volume 2 and continues with Sorghum and pearl millet, reviewed by J. H. Martin; starting with an account of the botanical relationships of the genus *Sorghum*, the author then considers flowering and seed formation, including techniques of pollination, intergeneric and interspecific crosses and induction of mutations; next come the basis and methods of breeding, including a section on breeding hybrid sorghum, to be followed by the genetics of sorghum and results of breeding, the most outstanding of which are said to be the production of dwarf and hybrid sorghums, varieties resistant to *Periconia* root rot and other diseases and pests, and sorghums with glutinous grain. Pearl millet (*Pennisetum glaucum*) is reviewed on similar lines, the topics covered being taxonomic relationships, pollination, genetics and breeding. This instalment contains subject index, title pages, list of contents, prefaces and list of contributors to volume 2 and completes that volume.

With the completion of the first two volumes, dealing respectively with general principles [cf. XXVIII, 1089] and with cereal breeding, we are able to assess the great value of this manual as a source of reference to work on plant breeding. The mode of serial publication inevitably brings with it certain attendant disadvantages, not the least of which is that on the completion of the entire work some of the earlier contributions will be largely out of date. This notwithstanding, the manual will, like its predecessor, remain for many years a standard work of reference in all branches of research in plant breeding and many allied fields such as applied genetics, cytology and field experimentation.

Instalment 28 continues the section on *Trifolium* in volume 4, completing the introductory paragraphs on systematics and passing on to Rotklee *Trifolium pratense* L. [Red clover, *T. pratense* L.]. The reviewer considers first the taxonomic relationships of the species, its origin and range of variation and the history of its domestication. The possibility of using wild forms as breeding material is discussed and attention is called to the wide range of ecotypes existing in the populations cultivated in different localities at the present time. A review is given of what is known on the inheritance of various morphological characters, of the symbiotic relationships between the red clover and the root-nodule bacteria, of self sterility and fertility and of various economically important characters such as tillering capacity, height, leafiness,

persistency, winter hardiness, chemical composition and disease resistance, various correlations being mentioned; the various factors that affect developmental rhythm, questions of pollination and finally the various methods adopted in breeding are examined; the methods described include various forms of selection, inbreeding (or close breeding) for the production of hybrids, which has not so far met with much success, hybridization, the production of polyploids and the induction of mutations. Among the achievements in red-clover breeding, several disease-resistant varieties and a polyploid are mentioned. The next section is Weissklee,*Trifolium repens* L. [White clover, *T. repens* L.] and deals with taxonomic relationships, cytology and the genetics of morphological and other characters, chief among the latter being the content of cyanogenetic glycosides, winter hardiness, resistance to drought and diseases, competitive ability and persistency. The floral biology and breeding methods are described briefly; the main achievements of breeding comprise a series of hybrid varieties and very little progress is reported from the use of heterosis or polyploidy.

Instalment 29 gives us the beginning of volume 5, devoted to special crops such as those producing oil, protein, fibre, spices and medicinal drugs. It starts with Cruciferen-Ölpflanzen [Cruciferous oil plants], by G. Andersson and G. Olsson, which provides first a useful outline of the taxonomic, genetic and cytological relationships of the main species of the genus *Brassica* and related genera. Those producing oil are then dealt with in detail, starting with swede rape (*B. napus* ssp. *oleifera*); descriptions are given of the main morphological features, the floral biology and crosses with other forms, species and genera, indications being given of the species with which spontaneous crossing is most and least likely. Reference is made to data showing that different lines react differently to inbreeding, to the possible use of heterosis in breeding hybrid lines, to the production of synthetic rape by various workers from crosses of *B. campestris* x *B. oleracea* and to several other amphidiploid combinations. Various correlations are examined, an outline is given of those characters whose inheritance has been studied and finally the various breeding methods are described under the headings land varieties and cultivars, cultivar crosses, species crosses and mutations. An outline is given of results obtained in breeding for winter hardiness, oil content, freedom from shedding and resistance to diseases and pests in winter rape and there follows a brief section on breeding summer rape. Lembke's rape and the synthetic rapes are mentioned as the greatest achievements of breeding.

Turnip rape (*B. campestris* ssp. *oleifera*) is treated on similar lines, a table of the distinguishing features between the two rape species being provided. Among the breeding achievements, the Svalöf hybrid Duro receives special mention.

The last three pages of this section are devoted to white mustard (*Sinapis alba*).

The instalment continues with the beginning of Soybean breeding, by H. W. Johnson, the portions covered being those on biology of flowering and seed formation and foundation and methods of breeding.

3318 Rudorf, W. & Baerecke, M.-L. (Editors).
Dreissig Jahre Züchtungsforschung. Zum Gedenken an Erwin Baur. (**Thirty years of breeding research. A memorial to Erwin Baur**).
Gustav Fischer Verlag, Stuttgart 1959 : DM 27.00 : Pp. viii + 241 : 116 figs.

To mark the 25th anniversary of the death of Erwin Baur, the first director of the Kaiser-Wilhelm Institut für Züchtungsforschung, this memorial volume has been compiled, the contributors being present or past members of the institute or former pupils of Baur. The first is W. Rudorf, who gives a brief biography of E. Baur and outlines the development of the institute in the years before and after the second world war.

The next section of the book deals with the genetics of *Antirrhinum majus*, begun by Baur in 1904 and carried on uninterruptedly ever since by one or other of his pupils; one of these, Emmy Stein, had begun as early as 1918 with research on the induction of mutations by irradiation. The work on induction of mutations by irradiation and chemical agents has been continued by Stubbe and others, some of the mutants produced having been distinguished by a positive selection value. Other subjects that were studied on the *Antirrhinum* material were linkage, cytology, the origin of species and their interrelationships and the mutual effects of rootstock and scion; no indication of any abnormal segregation in grafted plants has so far been observed in the extensive material investigated.

The studies on mutation form the subject of the next chapter; work by Kaplan, Gaul and others indicating a difference in nature between gene and chromosome mutations is cited, together with data that show the possibility of

altering the mutation spectrum by the application of various agencies such as colchicine, CO_2 or high temperatures; the proportion of desirable mutants remains however disappointingly low. Several successful polyploids are mentioned under the heading genome mutations.

The extensive work on cytoplasmic inheritance later associated with the name of P. Michaelis was also started by Baur and is outlined. Cytological studies are referred to in a special chapter on general cytology and again in the chapter on wide crossing and many of those devoted to special crops.

A special chapter is devoted to treatment with controlled photoperiod and temperature, many experiments being mentioned that show that the two factors are often complementary in effect and that growth substances are responsible for the effects, the characteristic reactions of different plants being hereditary. Another chapter deals with chemical investigations, particular reference being made to the various methods elaborated by members of the institute for the rapid estimation of substances such as alkaloids in lupins, *Datura tatula*, tobacco and other plants, galegin in *Galega officinalis*, mustard oil in *Brassica* crops, coumarin in sweet clover, protein and oil in a number of crops, fibre in hemp, rubber in kok-saghyz and cyanogenetic glycosides in sorghum. Full analyses have been made of the alkaloids in various species of lupin and their inheritance studied. Excess of DNA over RNA and other chemical differences have been established as contributing to the dwarfing in some of the F_1 hybrids of *Phaseolus vulgaris* x *Ph. multiflorus*.

In the chapter on breeding for disease resistance, various types of resistance found in cultivated plants are described; the experience of the institute has led to an increasing use of absolute resistance in breeding cereals for rust resistance but for potato blight more and more use has been made of field resistance; in all cases as many different sources of resistance as possible are used in the breeding work. A summary is given of the resistance genes found in breeding work with wheat, barley, potato, French bean, tomato, vine, apple and various small fruits.

The remainder of the book is taken up with brief outlines of the results of breeding work carried out at the institute with barley, wheat, rye, maize, millets, lupins, broad bean, soya bean, potato, Jerusalem artichoke, various oil and fodder plants, tomatoes, sweet pepper, French bean, various medicinal plants, apples, cherries, plums, vines, various small fruits, forest trees and fibre plants. Most of these results have been reported in the literature and referred to *passim* in *Plant Breeding Abstracts*. They provide however an extremely convenient source of reference to the entire work of the institute and furthermore enumerate the named varieties of the respective crops that have been released either by the institute itself or by private breeders working with material supplied by the institute.

A glossary and selected, though very comprehensive, bibliography complete the work.

3319 MARTIN, H.
The scientific principles of crop protection.
Edward Arnold (Publishers) Ltd., London 1959 : 4th Ed. : 65s. : Pp. viii + 359 : figs. : tables.

The present edition follows the plan of the previous one which appeared in 1940 [cf. X, 323], except that the expansion in knowledge concerning the modes of toxic action has permitted a more coordinated treatment and a discussion of the general principles of toxicology prior to their specific application in the case of various groups of protective substances. The introductory chapter is followed by chapters on: plant resistance to pathogens with reference to breeding, genetics and the nature of resistance; the influence of external factors on the susceptibility and liability of the plant to attack; biological control; fungicides and insecticides; the measurement and mechanics of toxicity; fungicides; insecticides grouped under inorganic compounds, naturally-occurring contact insecticides and synthetic contact insecticides; weed killers; fumigants; seed treatment; soil treatment; traps, and the treatment of the centres and vectors of infection. References to papers and books which have been published more recently than 1940 have been incorporated throughout and the title has been changed in conformity with the more common usage of the term crop protection in preference to plant protection.

3320 *STOLETOV, V. N.
(Intraspecific conversions and their nature).
Sovetskaja Nauka, Moskva 1957 : 31 r. 15 k. : Pp. 694. [Russian].

In this monograph, the author presents the results of experiments performed over a period of seventeen years on a single problem, the

* An extended summary of this work is on file at the Bureau.

conversion of winter wheats into spring wheats. Literature data are cited in support of the view that clear biochemical differences exist between winter and spring varieties, and that these differences correspond to the differences in climatic conditions under which the two normally develop.

The prevalence of the idea *Natura non facit saltum* in classical and medieval writers is exemplified by a number of quotations and is regarded as the germ of evolutionary ideas, later to be developed by Lamarck, Darwin, Mičurin, Dokučaev and others. From the viewpoint of dialectical materialism however the principles of discontinuity and continuity become aspects of a single whole.

Chapter 1 deals with the conversion of Lutescens 0329 winter wheat into a spring wheat by sowing it in spring for eight successive years. The initial material was obtained from a single ear, the 48 grains of which were sown in 1940 in a vegetable patch away from other wheats; 8000 grains were obtained in 1941 and produced what is referred to throughout the text as a "pure-line". In 1942, the seeds were vernalized for different periods, 150 being placed in a cold chamber at 1–3° C. on 27 March and other lots of 150 at successive days until 12 May, there being thus 47 treatments in all. Untreated seed of Lutescens 0329 and of spring wheat Lutescens 062 served as controls. In the treatments with 47 and 46 days vernalization all plants eared, in those with less than 36 days none eared, whereas in treatments with 45–37 days some plants eared and others did not; the time of earing also varied from plant to plant. Those plants that failed to ear were discarded from the experiment. The 39–37-day treatments produced very few, imperfectly developed, grains which were also discarded. The seed from the 47–40-day treatments were sown in April 1943 without further vernalization or other treatment. All produced a certain number of ears, though earing was later than in the spring control; those that received the longest vernalization in the initial treatment eared the latest and had the lowest percentage of plants that eared, though in all treatments the time of earing varied from plant to plant. Of 2354 plants, 150 formed ripe grain and 548 formed ears that remained green; the rest formed no ears.

In 1944 the progenies of 48 single ears selected in 1943 from the treated plants were sown separately. They eared at different times, but the earliest of all, on 9 Aug., was 13 days later than Lutescens 062; individual plants within the progenies also differed in time of earing. The number of plants that matured ears varied in the different progenies from 12·0 to 96·5%. Family 44, having the greatest number, was divided into 10 groups differing somewhat in time of ripening and in morphological features. Each of these groups was sown separately in 1945. The progenies differed by up to 21 days in the time at which they started earing, the earliest being plant 6, which was only 10 days later than Lutescens 062. The most uniform ear emergence and the highest percentage of ripe ears occurred in the progenies of the plants showing morphological deviations from the type. The intermediate types were frequently characterized by the formation of an abnormally large number of ears per plant.

In later generations all grown under spring conditions family 6 continued to be the earliest in earing and by the eighth generation it was as early as the spring wheat Lutescens 062, behaving in all respects as a spring wheat. After the eighth generation no earing occurred in any of the lines other than line 6.

In chapter 2 a number of variations of the treatment are described; in some of the lines grown at other places a certain number of spring forms developed in the later generations.

Chapter 3 deals with the behaviour of different generations when sown in winter. After 1–2 generations of winter sowing most lines behaved as winter wheats and failed to ear when sown again in spring.

Chapter 4 describes the hybrids produced by crossing F_5 plants of line 6 of family 44 with the winter wheat Moscow 2411. A number of lines obtained in the progeny behaved as alternative wheats. When the hybrids were back crossed by pollinating them with the original family 44 most of the progeny also behaved as alternative wheats.

F_1 plants pollinated with mixed pollen of Ukrainka and Moscow 2411 gave rise to hybrids that mostly behaved as spring wheats, some of which however survived in winter sowings.

The same F_5 line of family 44 was also pollinated with branched *Triticum turgidum* and the results are described in chapter 5; only some of the progeny eared in spring sowings. Several families segregated for awning in the F_2 and one plant bearing awned and awnless ears on the same plant gave rise to two lines, designated 998 Erythrospermum and 998 Lutescens respectively. Both these lines behaved as winter wheats having a long vernalization stage and considerable winter hardiness, although these properties were absent in both of the parents.

These lines are considered to be of practical interest. No such promising segregates appeared in hybrids of *T. turgidum* with Moscow 2411 or Lutescens 0329.

Yield tests described in chapter 6 showed that in years favourable for spring wheat family 44 generally yielded more whereas in unfavourable years it yielded less than Lutescens 062.

Family 998 referred to above exceeded a highly productive variety such as hybrid 186 in number of grains per spikelet and per ear and for this reason an F_4 plant of family 998, grown in winter sowings, was pollinated in 1952 with an F_{10} plant of family 44 sown in spring. All the hybrids were extremely uniform and showed hardly any sign of segregation in morphological characters. Phasic analysis showed their vernalization stage to be longer than that of the 998 parent and even that of the original Lutescens 0329.

In the concluding chapter reference is made to the failure of certain other workers to repeat the results reported in the Soviet Union. Stubbe [cf. XXVI, 1146] is thought to have used the wrong temperatures, having applied Lysenko's first method, using + 15° C., rather than the 1937 method, in which the temperatures are 0–3° C. for 30–35 days, gradually rising to the normal spring temperature. Other experiments of the author are referred to in which partial vernalization led to the segregation of spring forms corresponding to line 6 described above. Some varieties proved more difficult to convert than others. In all cases, differences in behaviour are regarded as not hereditary in nature but representing "small quantitative differences of a physiological character". They may become hereditarily established in the later generations. This viewpoint is supported by a citation from Darwin's *Origin of species*.

3321 Choudhuri, H. C.
Potato in West Bengal.
Home (Publicity) Department for the Directorate of Agriculture, Government of West Bengal. Undated : 9s. 9d. : Pp. 125 : 48 figs. : 38 tables : 4 plates.

Because of the high population density of 806 persons per square mile in West Bengal and because the potato gives a much higher calorie outturn per given area of cultivation than rice or wheat, the problem of increasing potato production in this state is of outstanding importance. This book has therefore been written with the aim of contributing towards the solution of the problem, by providing information on the chief aspects of production for students, extension workers, growers and the general reader. An introductory chapter on potato production in West Bengal is followed by chapters on cultivation, storage, diseases and insects and their control, and commercial varieties. The eight varieties described include Rangbull 9, a first early recently developed at the Potato Breeding Station, Rangbull, Darjeeling. The next four chapters report the results of experiments carried out in the state to test sprays for controlling late blight, the effects of growth substances on yield, methods of insect and disease control during storage, and fertilizers. Two further chapters offer instructions for preparing insecticidal and fungicidal mixtures. The book concludes with information on the results of varietal trials, the position as regards seed supplies, varietal reactions to viruses, and marketing. This simply written but useful book is clearly illustrated by photographs and charts.

3322 Hogen Esch, J. A., Nijdam, F. E. & Siebeneick, H.
Dutch potato atlas. Second supplement.
H. Veenman & Zonen, Wageningen undated : f. 11.25 : unpaginated : plates.

The second supplement to the above guide [cf. XXVII, p. 762] gives detailed and illustrated descriptions of the following varieties, most of which were introduced in the Netherlands during 1956 or 1957: Ambassadeur [Ambassador] (Black 1256 x Libertas); Avenir [Future] (D21 x Katahdin); Burmania (Pimpernel x Libertas); Kwinta (Eigenheimer x Record); Luctor [Orion x (Bevelander x Katahdin)]; Meerster [Lake Star] (Meerlander [Lakeland] x IJsselster [IJssel Star]); Pionier [Pioneer] (Noordeling x Record); Profijt [Profit] (K264 x Matador); and Rival (Record x Aquila) [cf. XXVI, 2501 and XXVIII, 683].

3323 Ceapoiu, N.
Cînepa. Studiu monografic. (**Hemp. A monographic study**).
Editura Academiei Republicii Populare Romîne 1958 : Pp. 734 : 143 figs. : 107 tables.

A Rumanian monograph on maize was recently reviewed in these pages [XXVIII, 4944]. The present volume, devoted to hemp, and, unlike its predecessor, the production of a single author, is planned along similar lines. Hemp, although only a major crop in certain areas, has been the object of considerable research, and the present volume provides a useful survey of

the problems relating to this crop, in particular in central and eastern Europe.

The book is divided into two unequal parts, the first and larger portion dealing with botanical and agronomic aspects and the second with industrial processing.

After a short introductory chapter, the classification of the genus into species, varieties and lesser taxa is outlined, following the arrangement devised by Serebjakova and Sizov in the Cultivated Flora of the USSR. Morphology is treated next with special attention paid to the anatomy of the fibre bundles. The fourth chapter is somewhat miscellaneous; it provides data on sex ratios, parthenocarpy and parthenogenesis and the effects of temperature, moisture, light and nutrients on development.

The title of chapter V, Biochimia cînepei [Biochemistry of hemp] is a little misleading. It is concerned chiefly with the fibre content of Rumanian varieties grown under various environmental conditions. Some information is also given on varietal differences in the oil content of the seeds. A striking example of reticence is provided by the omission of any information on the quantity and composition of the narcotic resin.

Fibre assessment is dealt with in chapter VI and the two following chapters are concerned respectively with rotations and organic and mineral fertilizers.

Another miscellany confronts us in chapter IX, Agrotehnica cînepei [Agrotechnology of hemp]. Plant breeders will be interested in the descriptions of the two standard varieties at present officially recognized in Rumania, ICAR42/118 and Carmagnola-Cluj, and of a number of Rumanian land races. Other topics comprise seed testing and treatments, vernalization, sowing dates and rates, weeds, of which wild hemp may cause varietal contamination, supplementary pollination and harvesting. Pathology is treated in chapter X, with attention paid to physiological diseases, viruses, fungi, angiosperm parasites and insects.

The chapter of principal interest to plant breeders is the eleventh, Ameliorarea cînepei [Hemp improvement]. After a brief account of hemp breeding in Rumania, which began at Cluj in 1934, the cytology of hemp is outlined and the various breeding objectives are set down with indications of the initial material of value for these purposes. Breeding techniques are considered in some detail. Vegetative hybridization is mentioned as a technique whose efficacy is as yet uncertain. The author also refers to his own experiments on training hybrids on various soil types [cf. XXVII, 3237, 3797 and XXIX, 2883] but it does not emerge whether or not this technique is believed to bring about any direct genetic gain. The latter part of the chapter is devoted to the breeding of monecious and hermaphrodite hemp and is largely based on work done elsewhere. However, Rumanian work on this aspect began in 1956 and is summarized on pp. 468–9.

The last chapter of the first part is entitled Producerea de sămînţă [Seed production]. This chapter is also of interest to breeders since, in addition to the topic described by the title, it also describes Rumanian work on the production of heterotic F_1 hybrids which is omitted from the preceding chapter.

Part II deals principally with retting, scutching and commercial grading.

The bibliography comprises 486 titles and is followed by long summaries of the entire book in Russian and German.

3324 Krümmel, H., Groh, W. & Friedrich, G.
Deutsche Obstsorten. (**German fruit varieties**).
Deutscher Bauernverlag, Berlin 1958 : 7. Lief. : DM 14.60 : unpaginated : figs. : plates.

The seventh instalment of this useful work [cf. XXVII, p. 166] comprises sheets for two more apple varieties, five pears, two cherries and two plums.

3325 Rohmeder, E. & Schönbach, H.
Genetik und Züchtung der Waldbäume. (**Forest tree breeding and genetics**).
Paul Parey, Hamburg & Berlin 1959 : DM 38.00 : Pp. 338 : 163 figs.

The original intention of the authors, to write a comprehensive handbook covering the whole literature of forest breeding and genetics, proved impracticable owing to the magnitude of the literature that has developed in this relatively new branch of science. It was therefore decided to produce a text book covering the main branches of the science, with references to sources of more detailed information for those who require it. The result is a most readable book giving a very complete picture of the many aspects of the subject.

After an introductory chapter setting out the main objectives of forest-tree improvement, an account is given of the variation that exists within all natural populations, and of its causes, genetic and environmental; the provenance tests carried out by W. Schmidt and others are referred to in this connexion. Variation in both

morphological and physiological characters is discussed. Different modes of reproduction, sexual and vegetative, found in forest trees are examined and the reproductive organs described and illustrated. Next comes a succinct but clear exposition of the principles of cytogenetics, with a special section on the chromosomes of forest species. Questions of provenance testing and local races are then discussed in more detail, attention being called to the difficulties attending on an exact definition of the lower taxonomic units such as subspecies, variety and ecotype; the evolutionary factors that have led to the origin of local races are analysed and illustrated by reference to species such as *Larix decidua*, *Pinus contorta* and *Abies borisii*.

The third chapter deals with breeding methods. Various forms of selection and their application are described, and an account is given of some of the many crossing experiments that have been carried out with forest trees; mention is made of the occurrence of heterosis in many hybrids between species, though not all cases reported in the literature are considered to be established as instances of true heterosis. Numerous cases of reduced vigour and fertility in selfed progeny are cited; though no case of the use of inbred lines for the production of heterotic hybrids could be found in the literature, the method is considered to have promising possibilities. The various techniques used in hybridization in forest trees are described. The section on mutation deals first with polyploids, then with various chromosome and gene mutations. Under methods of testing parental material and progenies an account is given of methods of field experimentation.

The fourth chapter comprises a series of reviews of the results of breeding work that has been carried out over the last 50 years with each of the main forest trees, starting with the main conifers and finishing with a series of angiospermous genera of lesser importance such as lime, sycamore and willows.

The volume is completed by a glossary of technical terms, comprehensive bibliographies and author and subject indexes.

3326 KRAHL-URBAN, J.
Die Eichen. Forstliche Monographie der Traubeneiche und der Stieleiche. (**The oaks. A forestry monograph of *Quercus sessiliflora* and *Q. pedunculata***).
Verlag Paul Parey, Hamburg and Berlin 1959 : DM 48.00 : Pp. 288 : 110 figs. : tables.

A single monograph devoted to the oaks is very much of a rarity these days and for that reason alone this handsome volume is to be welcomed. Written by an acknowledged authority, with more than thirty years of personal experience of the oaks, it begins with an account of the history of these two oaks, which are thought to have reached Germany from the south in the period 6500–6800 BC; information is given on past and present distribution, the many uses to which oaks were put in past centuries, and their present uses.

The third section of the book deals with the oak species known in Europe, and their distribution; the main features that distinguish *Q. sessiliflora* and *Q. pedunculata* are defined and illustrated, grounds being given for regarding the latter species as having been derived from the former. The two species are then described, it being pointed out that in many physiological characters the differences that have been observed between races of different provenance within a species are often greater than those between the species. It is only since the beginning of this century that serious attention has been given to the existence of local races and reference is made to the provenance tests started by Cieslar in Austria in 1905, and to many others that followed, all of which have pointed to the existence of clear genetic differences between the races from different localities. An extensive series of provenance tests planted by the author in 1949 with representative material from all parts of Germany, and a number of other countries too, is beginning to show the existence in both species of considerable differences between races from different localities and even from different parts of Germany in respect of such characters as height, beginning and end of vegetation, habit and mildew resistance. Nine distinct races have already been distinguished within each species and are described. Foresters are recommended to give more attention to these racial differences and also to the clear ecological differences that have been established between the two species. In general the results have confirmed the earlier conclusion of Cieslar that seed from a cooler area than that in which it is planted gives the hardiest progenies.

Notwithstanding the rarity with which hybridization between the two species occurs, grounds are presented for supposing that a number of natural hybrids do occur where the zones of the two species overlap. The author has observed them frequently in Sweden and Yugoslavia. Though no signs of heterosis have been observed in the hybrids the author sees no reason why they should not provide useful planting material.

The climatic, soil and other requirements of the two oaks are examined and summary information is given concerning the ecological conditions in which they occur in various parts of Germany and adjacent countries. Floral biology, vegetative reproduction, stages of growth and the chief diseases are then dealt with. The fourth section of the book is concerned with various aspects of sylviculture, including selective thinning at various stages of growth; the main criterion is habit, the upright type with a single main axis being preferred; such trees occur in natural populations in proportions varying from 70% in parts of Yugoslavia to 0% in parts of Germany; other criteria are vigour, freedom from disease, regularity of growth and freedom from epicormic branching. The best trees are marked as *Zukunftseichen* [oaks for the future], for purposes of reafforestation. Methods of natural and artificial reafforestation are discussed, the best nursery practices being outlined. The last section deals with felling, utilization and sale.

The bibliography contains 483 titles of works in German and selected lists of references to works from other countries; the selections, having been made largely by correspondents in the respective countries, seem a little arbitrary, the list for Yugoslavia for instance comprising 38 titles, that for the USSR 79 and that for the USA 4.

3327 Steven, H. M. & Carlisle, A.
The native pinewoods of Scotland.
Oliver & Boyd, Ltd., Edinburgh & London 1959 : 63s. : Pp. xv + 368 : 39 figs. : 10 tables : 20 plates.

The study of forestry offers ample opportunity for, and to some extent necessitates, a synthesis of diverse fields of study. The product of such a synthesis is admirably presented in this study of the history, botany and forestry of the native pine woods of Scotland. The authors are primarily concerned with securing the future of these, which they regard as a unique national heritage, and hope to further this end by stimulating the interest of both their owners and others. *Pinus sylvestris*, of which the Scots pine is most conveniently regarded as a geographical race, is the most widely distributed conifer in the world. In Scotland it is at the western extremity of its natural distribution and exists in several distinctive strains, hence the importance of ensuring their perpetuity from a forestry point of view. Also, they present one of the most interesting survivals of the natural vegetation of the country, having their own distinctive flora and fauna, and are thus of great ecological importance. In the third place, they are described by the authors as "not the least important of the historical monuments of Scotland". The truth of this is borne out both by the comprehensive account of their history given at the beginning of the book, from Pleistocene to modern times, and also by the individual historical sketches given for each of the major pine woods described.

The ecology of these and related communities is fully treated in chapter III, with detailed species lists in appendices. The problems of regeneration occupy a prominent part of the discussion.

The main body of the book, chapters 4–11, treats individually the numerous pine woods for which there is good evidence of natural origin. For the more important of these, details are given of their ownership and location, with a sketch map, followed by a review of their history, a description of the habitat, a botanical account of the forest itself, and notes on age, structure, flora and fauna, growth and stocking and state of natural regeneration.

Chapters 12–17 are concerned with a detailed account of studies of the variation of the species in Scotland, in respect of habit and vegetative and reproductive characters, with a discussion of the status of these variations.

The concluding chapter on the future of these pine woods draws together the threads and places the various topics in perspective, with the problems of securing regeneration, both natural and assisted, very much to the fore.

The book is eminently readable, and will appeal both to the specialist, whether biologist, archeologist or local historian, and to the general reader or student of the subject. To foresters it will be invaluable. It is well illustrated throughout though there is little reference in the text to the plates. This rather reduces the value of the chapters dealing with variation since, although nearly all the variants are illustrated, adequate references are almost completely lacking.

3328 Zhukovsky [Žukovskij], P. M.
(Cultivated flora of the USSR. XX. Vegetable plants fam. Solanaceae. Tomato, common eggplant, black nightshade, pepino, pepper, husk-tomato, mandrake).
Gosudarstvennoe Izdatel'stvo Sel'skohozjajstvennoj Literatury, Moskva-Leningrad 1958 : 15 r. 40 k. : Pp. 531 : figs. : tables. [Russian].

The second of the volumes of this valuable flora to appear since the war follows the first [XXVI,

p. 323] in giving more attention to the cultivars of the respective species. After a brief description of the family Solanaceae, an account is given of the genus *Lycopersicon*. Early studies, from the first description of tomatoes by Matthioli in 1554 to the works of Linnaeus, are outlined, the fact that the tomatoes in the early descriptions mostly had yellow fruits with ribs being remarked upon. Grounds are given for believing that the genus is relatively young and has only recently evolved from the genus *Solanum*, along two lines, viz. the edible group represented by *L. esculentum*, with fruits containing carotenoids of the lycopene type, and the inedible, represented by *L. peruvianum* and *L. hirsutum*, containing primarily β-carotene; the latter group is regarded as the oldest. All the early tomatoes are thought of as having been of the type *L. cerasiforme*, the development of multilocular and ribbed fruits being regarded as a relatively late stage in the evolution of the cultivated tomato, having come about in response to improved conditions of growth. The modern round-fruited forms arose, it seems, by selection and hybridization with *L. cerasiforme* and *L. pyriforme*.

The present classification of the genus was made on the basis of an extensive collection of forms grown in a wide range of ecological conditions in different parts of the Soviet Union. The number of species is reduced to three, *L. peruvianum*, *L. hirsutum* and *L. esculentum*, the last being subdivided into a number of subspecies, varieties and cultivars. Data are given showing the range of variation in both biological and morphological characteristics and the behaviour of the cultivars when the plants are grown under different ecological conditions; many of the differences in behaviour are ascribed to the effect of environmental factors on phasic development and other physiological processes. *L. esculentum* is divided into three subspecies, ssp. *pimpinellifolium*, with vars. *eupimpinellifolium* and *racemigerum*; ssp. *subspontaneum*, with vars. *cerasiforme*, *humboldtii*, *pyriforme*, *pruniforme*, *elongatum* and *succenturiatum*; and ssp. *cultum* with vars. *vulgare*, *grandifolium* and *validum*. Each variety contains a number of cultivars, which are described, indications being given of any that are useful for breeding, though the special features that make them of interest are not always defined. Their origin is also stated. In ssp. *cultum* cultivars belonging to a similar horticultural type are grouped together into a cultivar-type (conculta) and these are further arranged into six geographical groups (grex concultorum).

The descriptions of the cultivars are followed by sections on the history of the introduction of the tomato into cultivation in various European countries, the biology of growth of the different species and groups, including thermoperiodic and phasic reactions, sporogenesis, fertilization and embryology, the main diseases, genetics, breeding, anatomy and chemical composition.

Under genetics it is mentioned that cross pollination is fairly common in the south of the Soviet Union. The use of F_1 hybrid seed has led to improvements in earliness, yield and disease resistance and intravarietal crossing to increases in fruit size and yield, earliness and resistance to drought and disease; pollen mixtures from plants grown under different ecological conditions have given the best results; yield increases of up to 110% are referred to.

Data are reported which indicate that the inflorescences formed at the height of the growing season produce more vigorous seedlings with up to 10% more yield than those from the earlier or later inflorescences, pollinated with the same pollen parent. Flowers pollinated 6–7 days after emasculation gave a better set of seed than those pollinated immediately; in most parental combinations the set fell sharply in pollinations after 9–10 days but in some cases this was not so. Pollen that had been kept for 9–10 days gave greatly reduced sets and a lower proportion of seedlings showing the characters of the pollen parent. In both selfs and intervarietal crosses the yield of the hybrids was increased by adding pollen of other plants such as other tomato species or even wild potato.

Many interspecific crosses have been made possible by using mixed pollen or by preliminary grafting. Hybrids of *L. esculentum* x *L. hirsutum* formed no fruit when grown in normal daylight but did so in short photoperiods. The characters of *L. hirsutum* were predominant in both F_1 and F_2 generations, more segregation being observed under short photoperiods than in normal daylight; fruit formation in the F_2 also only occurred in short days. When a cultivated tomato was grafted on to the F_1 hybrid and pollinated with pollen from the hybrid, seedlings of three types were produced, some resembling the cultivated tomato, some being intermediate and some displaying depressed growth. So far no success has been attained in applying this method to crosses with *L. peruvianum*.

By previous grafting of the parents it was possible to reverse the dominance of certain characters, such as the potato-type leaf and yellow fruit colour, which were converted from

recessive to dominant; in some experiments the change occurred in the first generation but in others only in the second. The characters of the pollen parent tended to be more dominant when the flowers were pollinated 9–10 days after emasculation, and in the progenies of the first-formed inflorescences. Pollination with a limited number of pollen grains on the other hand reduced the dominance of the pollen parent. Certain changes in fruit form, ripening time, hardiness, chemical composition and other characters occurring in tomatoes growing in extreme climatic conditions were reproduced when their seed was sown in the vicinity of Leningrad. The dominance of normal growth over the fasciated growth of the upright types was reduced when an aging plant of a normal type was pollinated from an upright tomato.

In the section on breeding an outline is given of the achievements of tomato breeders in the USSR in the last ten years or so, most of which have been referred to *passim* in *Plant Breeding Abstracts*. Special attention has been given to the production of varieties that will ripen at lower temperatures, so as to extend the range of areas and seasons in which tomatoes can be grown. Other varieties have been bred for suitability for growing under irrigation and other special conditions but little has been achieved in breeding disease-resistant varieties. Data are given on the content of dry matter, sugars, acid and vitamin C in the main cultivars when grown in different localities.

Similar treatment is accorded to the egg plant, the study of which is traced from the sixteenth century. Four subspecies of *Solanum melongena* are recognized, sspp. *orientale*, *occidentale*, *subspontaneum* and *agrestis* and a number of varieties, each comprising a series of cultivars, are described, with indications of their origin and qualities. The first introduction of the egg plant into cultivation is thought to have been in India; in Europe it was not cultivated until the thirteenth or fourteenth century.

In the section on genetics, mention is made of some crosses in which forms ripening both earlier than the early parent and later than the late parent segregated in the F_2. Heterosis has been observed in respect of fruit size and yield. It has been established that the forms of fruit and leaves are correlated in inheritance, as are fruit form and quality of flesh. The characteristics of some subspecies, such as sspp. *orientale*, *subspontaneum* and *agrestis*, tend to be dominant in inheritance. Instances of segregation and heterosis resulting from vegetative hybridization are cited from the literature.

Chinese varieties are considered useful as parents in breeding for quality and Japanese for earliness. The varieties grown in the Soviet Union include 23 cultivars bred there and a number of unselected varieties and introductions.

In *S. nigrum*, five subspecies are recognized, within which 17 varieties are described. Various uses to which this plant and *S. muricatum* are put in different parts of Russia are enumerated. *Capsicum annuum* is taken to be a native of Mexico; all forms received from India, even when designated *C. frutescens*, have corresponded to *C. annuum*. Other species are found in Central and South America. Four species only are now recognized [cf. XXVI, 595], viz. *C. annuum*, *C. angulosum*, *C. conicum* and *C. pubescens*, each with several varieties, which are described. Within *C. annuum* the cultivars are described in groups, each group (conculta) having a number of common features.

In crosses of *C. annuum* x *C. angulosum* 42–66% set was obtained but the seeds did not germinate; in the reciprocal cross the set was only 2·8%. No fruit was set in pollinations of *C. annuum* with *C. conicum* or *C. pubescens*, although all the species have the same chromosome number ($2n = 24$). All varieties of *C. annuum* intercrossed and gave fertile hybrids, which often showed heterosis for yield, and for resistance to bacterial infection, wilt and frost, some of them having withstood — 6° C. Experiments in which heterosis was observed in graft hybrids are also cited.

In the genus *Physalis* three species are described, viz. *Ph. ixocarpa*, *Ph. pubescens* and *Ph. peruviana*, the first two having several varieties and cultivars.

Mandragora turcomanica is thought to be of value both for medicinal purposes and as a fodder plant and selections having sweeter and more juicy fruits have been made.

3329 **Tabulated information on tropical and subtropical grain legumes.** FAO UN, Rome 1959 : 17s. 6d. : Pp. xiv + 367.

FAO is undertaking a long-term project designed to promote and coordinate research and the exchange of information concerned with grain legumes suitable for the improvement of human nutrition. The first steps have been taken by the Plant Production Branch of the Agriculture Division, by the compilation of a list of the species and varieties of such legumes grown in tropical and subtropical regions. This geographical limitation was adopted primarily because most of the underdeveloped countries with major problems of human nutrition occur

in these regions. The term subtropical is used in a broad sense and includes, for example, Mediterranean climate. The genera concerned comprise *Arachis, Cajanus, Canavalia, Cicer, Cyamopsis, Dolichos, Glycine, Lablab, Lathyrus, Lens, Leucaena, Lupinus, Phaseolus, Pisum, Psophocarpus, Stizolobium, Trigonella, Vicia, Vigna* and *Voandzeia*. The publication gives information on 362 entries, under the uniform categories of (1) identification, (2) station submitting, (3) source of crop, (4) genetic origin, (5) uses, (6) seed availability, (7) major insect pests, (8) major diseases, (9) morphology and habit, (10) culture, (11) resistance to high temperature, frost, shade, drought, waterlogging and saline soils, and (12) yield and quality. In some cases, characters of interest for breeding purposes are indicated in a subdivision of (4). An appendix lists the geographical situations of the contributing stations, together with data on local temperature, precipitation and soil type. The tabulated information is available only in English but the French, Spanish and English equivalents for the headings in the categories and items is to be found on a blank information sheet which is placed before the entries.

NEW JOURNAL

***Annales de Génétique* (*Annals of Genetics*).**

The above journal is the organ of the French Genetics Society. Original papers by members of the society and reports of the society's meetings are to be published in the journal; occasionally numbers will be devoted to special subjects of genetical interest. The first issue, which appeared in April 1958, included reports of a mathematical study of tetraploids, a review of the physicochemical aspects of the effects of ionizing radiations and a study of nonreciprocal recombination in *Saccharomyces cerevisiae*. These papers are summarized in this issue of *Plant Breeding Abstracts*. The price for one volume of two numbers is 1500 Fr. in France and 2000 Fr. abroad. Further information may be obtained from: Expansion Scientifique Française, 174, Boulevard Saint-Germain, Paris-6.

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